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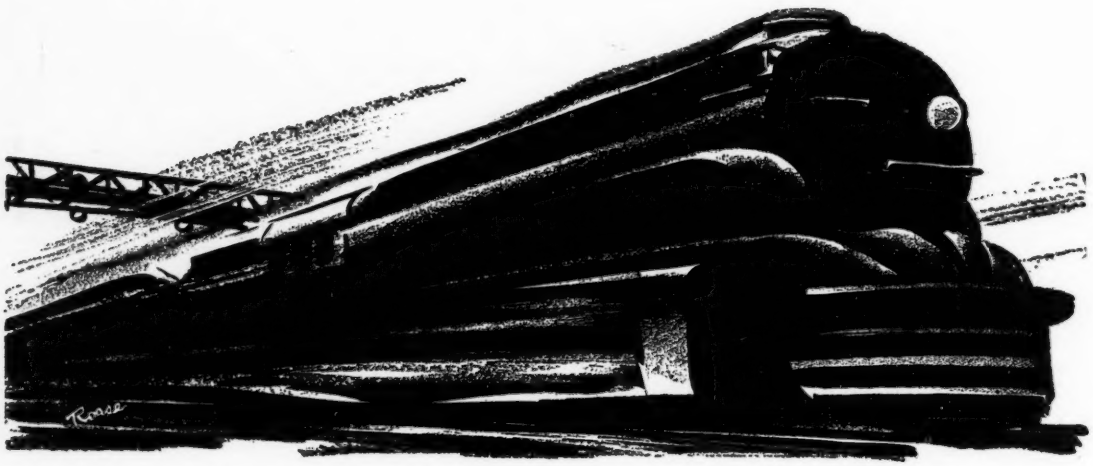

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Official Publication of the American Association of Textile Chemists and Colorists

THE OBJECTS OF THIS ASSOCIATION ARE:

"To promote increase of knowledge of the application of dyes and chemicals in the Textile Industry.

"To encourage in any practicable ways research work on chemical processes and materials of importance to the Textile Industry.

"To establish for the members channels by which the interchange of professional knowledge among them may be increased."

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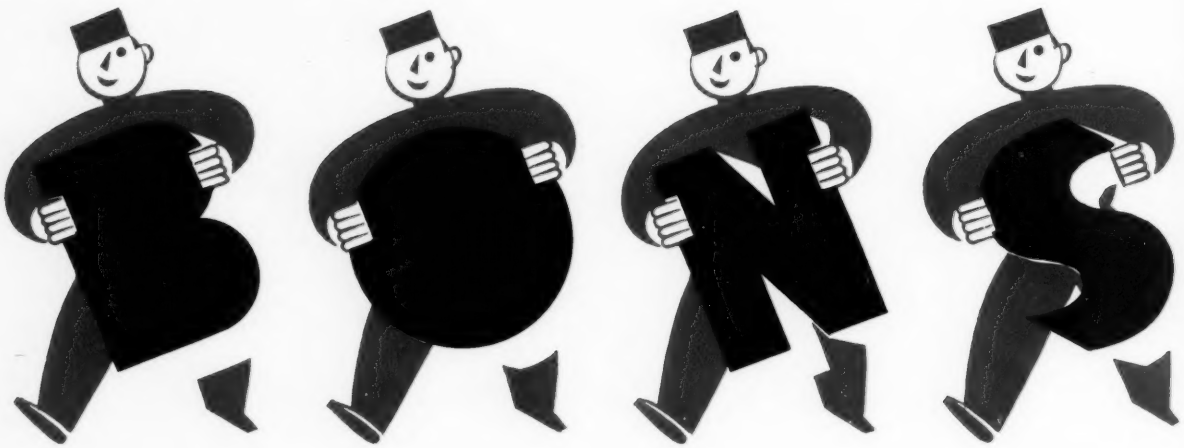

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AMERICAN
DYESTUFF REPORTER

VOLUME 26 MAY 17, 1937 NUMBER 10

Dyeing of Acetate Rayons*

F. BONNET†

THE dyeing of acetate yarns and fabrics presented quite a problem only a few years ago when the number of colors which could be used was limited, but in the course of these "few years" the research activities of the various dyestuff manufacturers have produced an ever increasing and comprehensive range of dyestuffs for this special type of rayon yarn.

Naturally all these colors do not behave alike any more than do the direct dyes for the regenerated cellulose type of rayon. Every dyer knows from experience that the rate at which an acetate dye goes onto the yarn or fabric is not the same for each dye. Some go on rapidly while others require much more time. It is obvious that for best results when dye combinations are used to obtain a given shade, that as nearly as possible dyes of the same rate of dyeing be chosen.

As long as the number of dyes was limited there was little choice and dyers had to get along as best they could, but as pointed out the range of colors has now been greatly increased and new colors are almost daily being added to the list so that it becomes increasingly important for dyers to evaluate their dyes and to intelligently choose dyestuff combinations for their particular shades.

For a number of years the dye laboratory of Courtaulds, Limited, in England has been conducting tests on dyes for viscose rayon. The methods advised by them for the selection of Direct Cotton Dyestuffs which will dye evenly on viscose have, since their publication in 1925 and subsequently, been gradually adopted as standard by many dyers. In the same way work has been going forward on acetate dyes. While the extent of this work is necessarily limited to those dyes commonly available and used in England and as applied to "Seraceta," nevertheless it was felt that publication of some of the results so far obtained might prove helpful to dyers in this country. In the case of direct dyes for viscose we know that many dyers have found the suggestions helpful in making their own tests which have enabled them to choose dye combinations which gave much more satisfactory results.

In the same way it is hoped that in presenting data from this English laboratory on a necessarily limited number of acetate colors, the dyers in this country will be stimulated to set up a similar routine for evaluating the dyes they are using or can obtain.

***This article is published for the purpose of advising dyers of acetate rayons, as well as the manufacturers of dyes for that purpose, as to methods which may be used for determining relative dyeing properties. Since these methods of testing were worked out in England, all of the dyes mentioned are those commonly used in Great Britain.**

We shall be pleased to publish similar tabulations of American made dyes if the information is available at the present time or may be worked out in the future.

RELATIVE DYEING RATES

The importance of the relative rates at which dyes go on to the yarn cannot be too greatly stressed. Usually the most rapid dyeing colors give the most even results and correspond to those dyestuffs showing maximum affinity at low temperatures, while the slowest dyeing dyestuffs give the most uneven results and correspond to those showing a minimum affinity at low temperature.

In order to determine the relative dyeing rates so as to decide whether a choice of dyestuffs is suitable or not the following method has been used.

Six skeins of yarn of the same weight are reeled preferably from the same spool or cone. Sufficient dye liquor of a compound shade is made up so that the proportion of dye liquor to yarn is 40:1. The dye liquor consists of a one-quarter per cent solution of potash olive oil soft soap containing the requisite amount of dye. The dye baths are then all raised to the same desired tempera-

†Viscose Co.

ture and the unscoured skeins entered. The temperature during the test is, of course, carefully kept constant. After 5, 10, 15, 20, 25 and 30 minute periods or alternatively 1, 2, 3, 4, 5 and 30 minutes the skeins are removed, given a light rinse and dryed. If the dye combination consists of let us say, three rapid dyeing dyestuffs the small skein dyed five minutes will be the same tone as the skein dyed 30 minutes while the difference in depth will not be very marked. If again the dye mixture under test consists of three slow dyeing dyestuffs, the five minute skein will be much lighter in tone than the one dyed 30 minutes. If, on the other hand, the dye mixture consists of two rapid and one slow dyeing dye, the skeins will not only grade in depth but will vary in tone and the slow dyeing dyestuff will predominate on the longer dyed skein.

It is essential for level results to choose dyes for compound shades which dye on at the same rate and it is obviously bad practice to use dyes in combinations, some of which show a maximum affinity at low temperatures and others minimum affinity at these temperatures, because they dye on at different rates and therefore give most uneven results with the wider contrast in tone. Tested in this way the following dyes are listed in the order of decreasing rates of dyeing which results have also been borne out in works experience. Those in the same bracket have approximately the same dyeing rate:

TABLE I

Dispersol F Yellow A

Setacyl Dt Orange 2R
Duranol Red 2B
Duranol Orange G
Duranol Red G
Dispersol Yellow 3G
Cibacet Scarlet G

Duranol Violet 2R
Duranol Brill Blue CB
Acetoquinone Blue NR
Celliton F. Navy Blue B
Duranol Navy Blue 0307
Duranol Blue G
Duranol Blue R

Dispersol Ft. Orange AS
Dispersol F. Red AS

Duranol Brill. Blue G
Celliton F. Blue Green B
Dispersol F. Orange BS

It would be poor policy, therefore, to use Dispersol F. Yellow A, for example, with Duranol Brilliant Blue G to give a level green.

BUILDING UP TEST

When dyes are used to produce heavy shades some will go on nicely and give clear dark shades, i. e., will build up well. Others will become dull and flat as the density in shade increases and some seemingly reach a limit of absorption in the lighter shades, i. e., show poor building up in the heavier shades. For example, in testing dyes for build-up eight heavy shades are dyed taking equal dry unscoured skeins of "Seraceta" and entering in a 40:1 dye bath made up with one-quarter per cent solution of potash olive oil soft soap containing the requisite amount of dye. The percentages of dyestuff in a series for one dye are: 10, 20, 30, 40, 50, 60, 80, 100 per cent. The skeins are entered at 65° C. after which the temperature is raised to 80° C. which is then maintained for 1½ hours. The skeins are then removed from the dyebath and fresh skeins are entered at 80° C. and dyed for one hour. Comparison of the first and second set of skeins gives an idea of dye exhaustion of the bath and also of the build-up value of the dyes.

The following dyestuffs (Table II) were found to build-up well:

TABLE II

Acetoquinone Blue NR
Dispersol Fast Orange AS
Setacyl Dt. Orange 2R
Cibacet Orange 2R
Dispersol F. Yellow A
Setacyl Dt. Scarlet G
Celliton F. Pink RF
Celliton F. Navy Blue G
Setacyl Dt. Blue GS
Duranol Green BS
Duranol Br. Blue CB
Duranol Blue 0140
Duranol Black B
Duranol Violet 2R
Duranol Violet RS

The following build-up well but the shade becomes dull and flat in very heavy shades:

Dispersol F. Red A
Cibacet Red GR
Setacyl Dt. Red GBN
Cibacet Scarlet G
Celliton F. Brown 3R
Celliton F. Brown 5R
Celliton Blue 3G
Celliton Red Violet 2R

The following show poor building up properties:

Dispersol F. Orange BS
Duranol Orange G
Setacyl Dt. Yellow 2R
Setacyl Dt. Yellow GR
Cibacet Yellow GN
Celliton Yellow 3GN
Duranol Red 2B
Duranol Red G
Celliton F. Blue Green B
Duranol Blue G
Duranol Brill. Blue G
Duranol Blue R

TEMPERATURE RANGES

While it is important to get the dyeing rate and build-up of dyes it is quite as important to know the optimum range of temperatures at which the dyes go on to the yarn to give the deepest shades and the greatest dye bath exhaustion.

For determining the temperature ranges giving the maximum depth of shade, sufficient dyestuff is weighed out and, in the case of pastes, a stock suspension is made using cold water. Powders are pasted up with warm water, about half the final volume of boiling water added, and then made up to volume with cold water. Sufficient of the freshly prepared dye suspension is then taken for six dyeings to which sufficient soap is added to give a final 0.25 per cent solution, after which the dye liquor is finally made up to the correct volume with cold water. The dye liquor is then measured into the dyepot so that the ratio of dye liquor to yarn is 40:1 and the temperature raised as quickly as possible to the temperature required, whereupon the unscoured yarn is entered dry into the dye bath. Dyeing is continued for 15 minutes at 40° C., 50° C., 60° C., 70° C., and 80° C. after which the yarn is removed from the dye bath, rinsed in cold water and dried.

Table III gives the results of such tests. The temperature or range of temperatures are those at which a maximum depth or shade was obtained in each case, e. g., 40-80° C. means that from 40° C. to 80° C. the depth of shade is approximately the same.

TABLE III

	Maximum Depth	*Affinity at low temperatures*
Yellows		
2.4% Dispersol Yellow 3G pst.	70-80° C.	Very good
3.0% Dispersol F. Yellow A pst.	40-80° C.	Very good
0.5% Cibacet Yellow GN pwd.	40-60° C.	Very good
1.0% Cibacet Yellow 3G pwd.	60-80° C.	Very good
0.9% Celliton F. Yellow 5G pwd.	80° C.	Very good
0.6% Celliton F. Yellow G pst.	60-70° C.	Very good
0.6% Celliton F. Yellow R pwd.	70-80° C.	Very good
0.25% Celliton Printing Yellow 3R pwd.	70-80° C.	Good
1.6% Dispersol F. Yellow CY pst.	60-80° C.	Good
2.7% Setacyl Dt. Yellow GR pst.	80° C.	Poor
0.5% Acetal Yellow G pwd.	80° C.	Very poor
Oranges		
0.2% Cibacet Orange 2R pwd.	70-80° C.	Good
1.0% Cibacet Orange 3R pwd.	70-80° C.	Good
1.5% Setacyl Dt. Orange 2R pst.	70-80° C.	Good
*2.25% Duranol Orange G pwd.	70-80° C.	Good
10% Duranol Orange C pst.	80° C.	Fairly good
2.5% Dispersol F. Orange A pst.	80° C.	Poor
3.0% Dispersol F. Orange BS pst.	80° C.	Poor
Reds		
x10% Duranol Claret B pst.	60-80° C.	Good
3% Duranol Maroon pst.	70-80° C.	Good
*1% Duranol Red 2B pwd.	70-80° C.	Good
*1.5% Duranol Red G pwd.	70-80° C.	Good
*2.0% Duranol Red B pwd.	70-80° C.	Good
0.4% Celliton F. Scarlet B pwd.	80° C.	Good
1.5% Celliton Red R pst.	80° C.	Good
0.3% Celliton F. Rubine R pwd.	70-80° C.	Poor
0.65% Celliton F. Pink 3B pwd.	70-80° C.	Fair
3.5% Duranol Scarlet 3B pst.	70-80° C.	Good
1.0% Duranol Scarlet 2G pst.	80° C.	Good
1.0% Cibacet Red GR dbl. pst.	80° C.	Poor
0.75% Cibacet Scarlet G pwd.	70-80° C.	Good
1.0% Cibacet Red 3B pwd.	50-70° C.	Very good
1.5% Dispersol F Red A pst.	80° C.	Poor
Violets		
3% Duranol Br. Violet B pwd.	60-80° C.	Good
1% Duranol Violet 2R pwd.	80° C.	Fair
1% Cibacet Violet 2R pwd.	60-80° C.	Good
0.9% Cibacet Violet B pwd.	60-80° C.	Good
3% Celliton F. Violet B pwd.	80° C.	Fair
Blues		
1% Duranol Blue CB pwd.	80° C.	Poor
*0.5% Duranol Brill. Blue CB pwd.	70-80° C.	Good
0.7% Duranol Blue G pwd.	80° C.	Poor
*3.0% Duranol Brill. Blue G pst.	80° C.	Very poor
1.5% Duranol Blue R pst.	80° C.	Poor
0.3% Acetoquinone Blue NR pwd.	80° C.	Poor
2.5% Acetol Blue RS pwd.	80° C.	Very poor
1.0% Celliton F. Navy Blue B pst.	80° C.	Poor
0.5% Celliton Blue Green B pst.	80° C.	Poor
x1.0% Celliton F. Navy Blue GT pst.	80° C.	Poor
0.2% Cibacet Sapphire Blue G pwd.	70-80° C.	Good
0.75% Cibacet Blue 2R dbl. pst.	80° C.	Very poor
0.7% Cibacet Blue B pwd.	80° C.	Poor
Blacks		
Duranol Black B pst.		
Setacyl Dt. Black RSN Supra		
Cibacet Black BN (green shade)		
are all mixings showing maximum depth at 80° C.		

The dyestuffs marked x are also mixings.

The dyestuffs marked * were dyed in both paste and powder varieties, and in all cases, excepting Duranol Orange G, the tone and the behavior at the different temperatures were found to be the same. With Duranol Orange G, the powder gave a redder shade than the paste variety.

HALF-SKEIN LEVELLING TESTS

A dye that shows good levelling results is one that permits dark dyed yarn to discharge its excess dye to yarn of a lighter shade until an equilibrium of the same shade results on both yarns. To check a dye in this respect six four gram skeins are wound from a cone or large commercial skein and half immersed in the dye bath for one-half hour at 80° C., the dye bath being again in the ratio of 40:1 and contains the requisite amount of dye in a 0.25 per cent solution of soap. After one-half hour at 80° C. the skeins are removed from the bath and thoroughly rinsed in cold water to remove all the soap from the yarn. The skeins are then treated separately in 40 times their dry weight of water for 0, 0.5, 1, 2, 3, and 4 hours at 80° C.

Table IV gives the results obtained:

TABLE IV

Yellows	*Levelling*
2% Silatose F. Yellow 5GL pst.	Good after ½ hour
1% Dispersol F. Yellow 3G pst.	Good after 1 hour
0.5% Cibacet Yellow GN pwd.	Good after 2 hours
3.0% Setacyl Dt. Yellow R pst.	Good after 2 hours
1.5% Dispersol F. Yellow A pst.	Good after 3 hours
0.5% Cibacet Yellow 3G pwd.	Good after 3 hours
5.0% Celatene F. Lt Yellow pst.	Good after 3 hours
0.5% Celliton F. Yellow 5G pwd.	Good after 4 hours
0.5% Celliton F. Yellow G pst.	Good after 4 hours
1.2% Dispersol F. Yellow CY pst.	Good after 4 hours
1.5% Setacyl Dt. Yellow GR	Fairly good after 4 hours
3.0% Setacyl Dt. Yellow 2G	Fairly good after 4 hours
0.5% Celliton F. Yellow R pwd.	Fairly good after 4 hours
3.0% Setacyl Dt. Yellow 2R	Poor after 4 hours
0.25% Celliton Printing Yellow 3R pwd.	Poor after 4 hours
0.5% Acetol Yellow G	Poor after 4 hours
Oranges	*Levelling*
8.0% Duranol Orange C pst.	Good after 3 hours
4.0% Duranol Orange G pst.	Good after 4 hours
0.25% Cibacet Orange 2R pwd.	Good after 4 hours
0.9% Cibacet Orange 3R pwd.	Fairly good after 4 hours
1.5% Setacyl Dt. Orange 2R	Poor after 4 hours
2.5% Dispersol F. Orange A pst.	Very poor after 4 hours
2.0% Dispersol F. Orange BS pst.	Very poor after 4 hours

Reds	*Levelling*
3.0% Duranol Red 2B pst.	Good after 3 hours
3.5% Cibacet Red 3B pwd.	Good after 3 hours
3.5% Duranol Scarlet 3B pst.	Good after 4 hours
3.0% Duranol Scarlet 2G pst.	Fairly good after 4 hours
2.0% Setacyl Dt. Pink 3B pwd.	Fairly good after 4 hours
1.2% Duranol Red G. pwd.	Fairly good after 4 hours
4.0% Duranol Red B. pst.	Fairly good after 4 hours
0.7% Celliton Fast Pink F3B pwd.	Fairly good after 4 hours
25% Duranol Claret B pst.	Fairly good after 4 hours
3.5% Duranol Scarlet B pst.	Moderate after 4 hours
9.0% Duranol Maroon pst.	Moderate after 4 hours
0.35% Celliton Scarlet B pwd.	Poor after 4 hours
3.0% Setacyl Dt. Red GBN conc.	Poor after 4 hours
4.0% Setacyl Dt. Red GN conc.	Poor after 4 hours
3.3% Setacyl Dt. Red BN conc.	Poor after 4 hours
2.5% Celliton Red R pst.	Poor after 4 hours
3.0% Cibacet Red GR pst.	Very poor after 4 hours
2.0% Setacyl Dt. Scarlet 2G	Very poor after 4 hours
0.6% Cibacet Scarlet G pwd.	Very poor after 4 hours
4.0% Dispersol F. Red A. pst.	Very poor after 4 hours
0.9% Celliton Fast Rubine B. pwd.	Very poor after 4 hours

Violets	*Levelling*
1% Duranol Violet 2R pwd.	Good after 2 hours
1% Cibacet Violet 2R pwd.	Good after 2 hours
2% Setacyl Dt. Violet R pwd.	Fairly good after 4 hours
2% Celliton F. Violet B pwd.	Fairly good after 4 hours
1% Duranol Brill. Violet B pwd.	Moderate after 4 hours
3% Duranol Violet RS pst.	Moderate after 4 hours
3.5% Celatene Br. Violet B pst.	Poor after 4 hours
1% Cibacet Violet B pwd.	Poor after 4 hours
4% Setacyl Dt. Violet B pwd.	Poor after 4 hours

Blues	*Levelling*
2.7% Duranol Blue CB pwd.	Fairly good after 4 hours
0.6% Acetoquinone Blue NR pwd.	Moderate after 4 hours
2.5% Celliton F. Navy Blue B	Moderate after 4 hours
1.7% Celliton F. Blue Green B	Moderate after 4 hours
4.0% Duranol Br. Blue CB pst.	Moderate after 4 hours
2.5% Duranol Blue R pst.	Moderate after 4 hours
2.0% Setacyl Dt. Blue GS	Moderate after 4 hours
0.5% Cibacet Sapphire Blue G pwd.	Moderate after 4 hours
9.0% Duranol Brill. Blue G pst.	Poor after 4 hours
4.0% Duranol Blue G pst.	Very poor after 4 hours
2.6% Celliton F. Navy Blue GT pst.	Very poor after 4 hours
1.5% Cellit Blue R pwd.	Very poor after 4 hours
10% Acetol Blue RS pwd.	Very poor after 4 hours
1.5% Cibacet Blue 2R dbl. pst.	Very poor after 4 hours
1.5% Cibacet Blue B pwd.	Very poor after 4 hours

Blacks and Greys	*Levelling*
10% Duranol Grey pst.	Very poor after 4 hours

None of the above tests, it will be noted, are in any way difficult and are such that any dyer can perform them as a regular routine. After more or less standardizing on a certain dye combination to give the shades desired, any new dyes can be tested and fitted into the group and range of colors already tested.

We would again point out that the dyes listed are merely used in illustration and in presenting these sample testing methods there is no intention of criticising or discrediting any one dye in favor of another. Some of the dyes listed may no longer be used and others may have been improved even though they bear the old designation. The results as given hold true only for the particular dyes used at the time the tests were made. We know, however, that when dyes are grouped according to these tests and used in combination as outlined above much better dyeing results.

Non-Slip Finish

on Rayon Fabrics

H. C. BORGHETTY*

THIS type of finish has only recently appeared on the market but it has already received favorable acceptance because of the advantages it imparts, particularly to fabrics of all rayon. Its main characteristic lies in the fact that the warp and filling threads are bonded together solely at the surface of interweave. The bonding material employed is of a very flexible nature so that the feel of the treated fabric is not objectionably altered from that of the original cloth. It is well known to the textile trade how fabrics, constructed wholly or partially of synthetic filament threads, tend to fray and slip badly as soon as a slight pressure is exerted in the direction of either warp or filling. This defect, which is very evident in flat rayon fabrics of low construction, e.g., 72/48, 68/44, taffetas; 140/68 and 110/60 satins and 84/64 or 94/64 twills, is highly objectionable in materials which are used as linings for overcoats and suitings. The weakening and tearing out of the seams is the direct result of fraying and it can be very readily illustrated by folding the fabric parallel to the warp or filling threads and then sewing the resulting double thickness about an inch from the crease. Then, taking the two flaps and straining the folded fabric, will quickly show how the seam causes the easily slippable threads to fray until they no longer hold.

A similar test on the same cloth treated with a non-slip finish will not show any fraying whatever excepting when subjected to a pressure which will actually tear the cloth. Comparative figures between the fraying strength of a regular fabric and a treated one, when measured on a Scott tester are approximately in the ratio of 1-5.

Although the non-slip finish can be applied to all textile fabrics, its immediate field of application is that of rayon fabrics for linings. Such materials require a fine, supple

*Chief Chemist, The Aspinook Company.

finish, which must withstand dry cleaning and repeated hot pressings. The non-slip finish is obtained without any addition of special equipment to the average finishing plant and its cost is only slightly above that of the regular finish which the market at present accepts. Its means of application consist in merely immersing the prepared cloth in a solution of synthetic resin, partially or completely polymerized, subjecting the fabric to a stretching operation (in a tenter frame) and drying it at the desired width. To obtain fastness to washing it is necessary to dry at a high temperature in order to cure the resin. Once the cloth is dry, it can be subjected to the regular finishing operations which are necessary to obtain the required feel. This method of application as outlined is quite simple and reliable providing the necessary control of the solution is made. So far, the best results are obtained with various synthetic resins, particularly those of the urea formaldehyde type, but other materials capable of locking the warp and filling threads at the contacting areas of interweave can be used. Materials available for this finish must possess several essential requirements, i.e., be colorless, odorless, neutral, preferably water soluble but capable of being cured to give subsequent insolubility.

There is a great deal of analogy between the method of application of the non-slip finish and that of the first synthetic resin finish used, i.e., the anti-crease process. The outstanding difference between the two processes lies in the fact that the *non-crease* finish requires a large proportion (10-15 per cent on the weight of the fabric) of resin content and this must be deposited inside the fiber, whereas in the *non-slip* finish the resin is deposited in a small quantity (one-quarter to one per cent on the fabric) around the threads. This implies that for the non-crease process the impregnating solutions must be preferably true water solutions so that colloidal swelling of the fiber takes place to permit the entrance of the resin. Heavy pressure mangles and the addition of penetrating agents are helpful to facilitate the essential high take-up of resin. In the non-slip finish, however, the reverse applies. True water solutions are *not essential*. Large quantities of resin and perfect penetration are not required while the deposit of resin should be made only at the surface of the *fabric* threads. Fabrics treated with the non-slip process possess far better wearing qualities than the original cloth because of the resistance to abrasion. One of the main improvements shown by the new finish is that fabrics of low construction, such as, e.g., 110/56 rayon satin, can be treated so as to be superior, as far as slipping is concerned, to non-treated higher constructions, e.g., 140/68.

Variations of this type of finish are obtained on other types of fabrics by using what is known as a setting or stabilizing process. The method of application is identical to that described above but the amount of resin deposited is approximately double. This increase of resin deposit is accomplished by merely increasing the resin content of the saturating liquid. The bond which results is firmer, stronger and somewhat less flexible than with the non-slip, but when applied to a fabric of spun rayon gives a stabilized fabric which has a decided individuality of its own. In fact, the sagging, shrinking and stretching properties which have always been a drawback of these fabrics are greatly reduced so that suitings and dresses made up of these materials can be worn without the fear of discarding them before the normal life of the garment.

TECHNICAL NOTES FROM FOREIGN SOURCES

Fiber-Damage Caused by Vat Dyestuffs Upon Cellulose

Hans Fraitzheim—Monats. f. Seide u. Kunstseide 41, 17 (1936).—A review of our present knowledge of the subject.

It has long been known that undyed cotton suffers a certain breaking down when exposed for some time to sunlight. This degraded cellulose has been named photocellulose by Kaufmann. Heermann has ascribed this photochemical degradation to the action of the ultra-violet component of sunlight. In recent years it has been discovered that the extent to which this damage to the fiber takes place depends essentially upon the degree of purity of the cellulose of the cotton. In one test, raw cotton lost 17 per cent in tensile strength, while boiled-off cotton lost about 51 per cent, when irradiated for the same length of time. It appears, then, that the "impurities" (the normally accompanying substances, from the cotton's point of view) in the raw cotton exert a certain protective action upon the fiber against light.

A somewhat similar situation exists in the case of dyed cotton. The yellow dyestuffs especially seem to be able to accelerate the breaking down of cellulose when exposed to light, while certain mineral substances, such as chromium or iron oxides, precipitated upon the fiber, retard the injury to the cellulose remarkably.

These tests were made by examining the breaking-strength of the fiber after comparatively long exposure to sunlight. A more recently known fact is more surprising, viz., that some dyestuffs, among them even some vat dyestuffs, are able to bring about this damage to the fiber by its exposure to light even in the very process of dyeing—an astounding acceleration. Thus, Scholefield has shown that all yellow and orange vat dyestuffs, with the exception of Indanthrene Yellow G and Alizanthrene Yellow 6R, bring about injury to the fiber during the process of dye-

ing. Whittaker has sought to determine empirically the conditions under which the vat dyestuffs can work the damage. Since the trouble has been noticed mostly with goods which would necessarily be exposed much to bright light (window drapes, furniture upholstery) with free exposure to the atmosphere, he has sought to identify, and warn dyers against, dyestuffs found to be unsuitable in this connection.

There is no question that the degradative process is one of oxidation of the cellulose. Loss of tensile strength of the fiber has been correlated with viscosity, increase in copper number, affinity for basic dyestuffs, etc. Whittaker has worked with breaking strength when wet, viscosity or fluidity, and copper number particularly. Of the dyestuffs examined by him and by his co-workers, it is the yellow vat dyestuffs which prove to be dangerous, and no others. The direct cotton dyestuffs exert a protective action upon the fibers.

As to the question of the influence of one or another of the components of sunlight, a series of samples of undyed viscose silk was exposed to light under various glass filters. The specimens exposed under ruby glass hardly lost any tensile strength (wet), those under ordinary red glass suffered hardly more, those under green, blue-green, and yellow glass suffered progressively more, and those under blue glass most.

More recent work by Whittaker covered the examination of woven goods tested after being stretched upon frames or upon a board, respectively, in air-currents of different velocity, and with the woven goods under various tensions; also the weaves composed of fibers of different titers, the goods being exposed to different directions in the sky. Very complex results were obtained, as might be expected.

Scholefield and co-workers have studied the problem from the chemical rather than from the general side. S. assumes that hydrogen peroxide is the active agent involved, and, following Engler, suggests that the formation of hydrogen peroxide is a result of pseudo- or indirect auto-oxidation; and states that a similar reaction may take place when the leuco-derivative of indigoid or anthraquinonoid dyestuffs are oxidized in the air in presence of aqueous alkali (and light). Experiments have shown that the same type of damage is caused by exposing to light the dyed material wetted with a very weak solution of hydrogen peroxide, in the absence of any leuco-vat dyestuff. It seems, then, that hydrogen peroxide is activated by the presence of yellow or orange vat dyestuffs; that is, it is sensitive to violet and blue light, which is absorbed by the cellulose-yellow-dyestuff-water system.

Landold soon after established the fact that it is not so much a weakening of the fiber which takes place in the actual dyeing itself, as it is a distinct attack upon the fiber, which is made subsequently, and under the one condition, that alkali be present. His view holds that there must be present the following conditions: a suitable dyestuff as catalyst, oxygen in the molecular state (as air or peroxide), alkali (hydroxide or carbonate), water, light of short wavelength (violet, blue). The dyestuffs which contribute to the effect are, as before, yellow vat dyestuffs. Fabrics dyed in the absence of light and dried are not harmed, by at least reasonable illumination, even in the presence of alkali. In the case of a compound dyeing, say, with Cibanone Orange R and Ciba Blue, dyeing in the ordinary way results in the destruction of the blue dyestuff, the fiber remaining unharmed.

The explanation of the phenomenon may, in brief phrase, be ascribed to the formation of hydrogen peroxide by a complicated auto-oxidation. A fully adequate, detailed account of the facts involved comprise the latter part of the paper. The subject is fully and clearly worked out, and the paper can be characterized as nothing less than a clear and complete exposition of the subject.

Methods of Determination of the Degree of Mercerization

Dr. K. Schulze—Monats. f. Seide u. Kunstseide 40, 472 (1935).—A detailed resume of the different methods proposed up to the present. The paper includes one graph and two illustrations, and is of value as a good summary of our present knowledge of the subject.

Quantitative Determination of Absorption of Dyestuffs by Rayon

Dr. W. Weltzien and Dr. K. Schulze—Monats. f. Seide u. Kunstseide 41, 142 (1936).—The paper prescribes certain carefully described and illustrated standard methods for the quantitative study of dyeings upon rayon (chosen, perhaps, only because of its representing a regular type of more or less constant properties).

The topics taken up and carefully discussed are

A—Pre-treatment:
- 1—Pre-cleansing of the fiber.
- 2—Purification of the dyestuff.
- 3—Preparation of the dyestuff solutions.

B—Dyeing experiments:
- 1—General conditions of working.
- 2—Preparation of the fiber.
- 3—Dyeing methods worked out or modified by the author:
  - a—Dyeing in stock.
  - b—Simultaneous dyeing of different types of fiber.
  - c—Dyeing experiments in the skein.

C—Measurement of absorption of dyestuff:
- 1—Through colorimetry of the exhausted bath.
- 2—Through stripping the dyeing by the pyridine method.

It will be seen from the above how carefully the subject has been worked out.

Four excellent diagrammatic illustrations of apparatus used, and a graph, are added. The paper is valuable and interesting.

(Continued on page 284)

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MAY 17, 1937

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Wool and Mohair*

WERNER VON BERGEN†

The article discusses the physical and chemical properties of the two main animal fibers and their differences and the behavior of the fibers in the manufacturing processes of woolen and mohair goods.

THE woolly hair-like covering of mamals belong to the order of Ruminantia is the most important textile fiber which is obtained from the skin tissues. The order has as its main members, sheep, goats, and camels.

Wool in common sense forms a protective covering of the domesticated sheep which has its home all over the world. The latest statistical datas estimate the total number of sheep as seven hundred million and the total world wool production as three thousand five hundred million pounds per year. In the United States alone we have fifty million sheep which yield approximately four hundred and thirty million pounds of wool. The sheep are usually shorn once a year and each yields on an average eight pounds of grease wool.

Mohair is a specialty hair fiber and forms a long, curly and lustrous coat on the Angora goat, which originated in Asia Minor. This goat is bred on a commercial basis in only three countries, namely: Turkey, Union of South Africa and the United States. The approximate number of animals

*Presented at meeting, New York Section, Nov. 20, 1936.
†Chief Chemist, Forstmann Woolen Company, Passaic, N. J.

in these three countries is 8,500,000 and the total production in raw fiber is 30,000,000 pounds per year. In the United States we have 4,000,000 Angora goats, yielding 16,000,000 pounds. In this country the goats are shorn twice a year, in Spring and in Fall and yield on an average four pounds of raw fibers, per animal annually.

In buying and selling wool, the trade follows twelve trade standards. The trade standards used in this country are also used in the British Empire. They are known by numbers, based on the possible spinning count and expressed as follows:

U. S. Wool Standard

		Approx. average diameter in microns	*Dispersion in microns*
Fine	80s	19	12-30
	70s	20	12-35
	64s	22	12-38
½ blood	60s	24	13-42
	58s	26	13-45
¾ blood	56s	28	13-48
¼ blood	50s	31	15-52
	48s	33	15-55
Lowquarter	46s	35	17-58
Common	44s	37	17-62
Braid	40s	38	17-65
	36s	40	17-70

In buying and selling mohair the story is somewhat different. The trade has not as yet arrived at a standard which is recognized by all parties, but the United States Department of Agriculture has issued a standard for criticism, consisting of four grades. Of these four grades, Kid Mohair is the finest; then come, First, Second, and Third grades. The author found based on the measurement of 1,000 fibers for each grade the following data:

Tentative Mohair Standard

Name	*Average Diameter*	*Dispersion in microns*
Kid	27	14-40
First	32	17-45
Second	44	18-70
Third	56	28-90

which places Kid mohair about even with quality 58-60; First—even with quality 50s; whereas Second and Third are below 36s, the lowest grade of wool.

Wool as well as mohair can be graded not only by visual means but also microscopically. In wool, especially in the top trade, we are now so far advanced that tops may be bought and sold on the basis of microscopic measurements —an achievement which I know no other country in the world has accomplished.

The tentative top specifications as worked out by the Top Committee of the National Association of Wool Manufacturers, jointly with the Wool Section of the American Society for Testing Materials, guiding the top trade are as follows:

Tentative Wool Top Specifications

Grade	80s	70s	64s	60s	58s	56s	50s
Not Less Than							
Fine Groups *Microns*							
A 10-20	60%	50%	36%	18%	16%	9%	4%
B 10-25	92%	84%	....	....	....	....	....
C 10-30	....	....	94%	83%	74%	64%	45%
Not More Than							
Coarse Groups *Microns*							
X 25-30	8%	14%	....	....	....	....	....
Y 30-40	....	2%	6%	17%	24%	31%	45%
Z 40-50	....	....	....	....	2%	5%	10%
Average fineness	18.5	20.0	21.5	24.5	26.0	27.5	31.0
(in microns)	19.5	21.0	22.5	25.5	27.0	29.0	33.0
Allowance for fibers coarser than specified in schedule	.25%	.25%	.25%	.5%	.75%	.75%	1.%

	80s	70s	64s	60s	58s	56s	50s
Minimum number of fibers required for test	400	400	600	800	800	1200	1200

PHYSICAL PROPERTIES

In Fig. 1, you see the Angora goat which yields the wonderful silk-like hair.

Comparing the main physical properties of wool with mohair we find that mohair more nearly resembles the English long wool type, which is characterized by its length and luster.

The English wool has an average length of from nine to fifteen inches. Mohair when full grown (twelve months) has an average length of from nine to twelve inches.

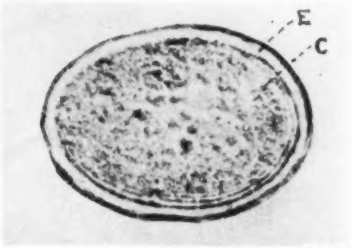
MICROSCOPICAL STRUCTURE

Now let us study the microscopical structure of these fibers. All hair fibers, no matter from which species of animal they are taken, consist of either two or three layers. The cross-section shown in Fig. 2, is a hair with two layers. The outer ring is the protective covering, called the epidermis; the inner layer, or cortex, is composed of longitudinal cells which we shall discuss later.

The cross-section, Fig. 3, has three layers: the epidermis, the cortex, and in the center of the fiber the medulla, which is similar to the marrow in our bones, but which is not there for the same purpose. Contrary to the statement made in some texts, the fiber does not depend for its nourishment upon the medulla. This is proven by the fact that the finest wool hairs have no medulla. By comparing the epidermis of both fibers as shown in Fig. 4, we find quite some characteristic differences. The hairs A and B of Fig. 4, show two types of epidermis structure from wool hairs, whereas, hair B is the epidermis structure of a mohair fiber. All three fibers are actually only photo-

Courtesy, U. S. Dept. of Agriculture

Fig. 1—Angora Goat.



500X

Fig. 2—Cross-section of Human Hair.

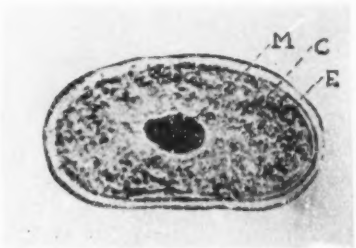


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Fig. 3—Cross-section of Human Hair.

graphed imprints which were prepared in the following manner: The fiber is laid flat on a thin layer of ordinary red fingernail polish while still in liquid state and allowed to remain there until it dries. Then the fiber is removed and the mold which is left is photographed.

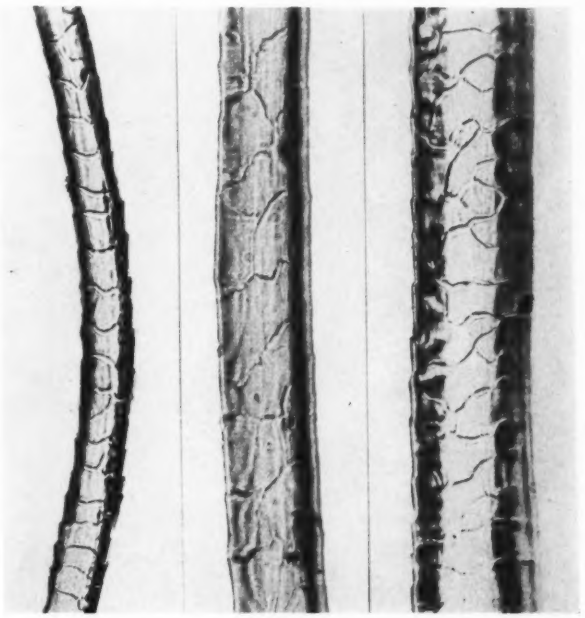
Fiber A is a very fine wool hair in which the scales are just large enough to go once around the entire circumference of the fiber. They are arranged like flowerpots set into each other. They overlap longitudinally and the edges stand out a little from the stem, causing the serrated appearance. Cast A was made from a very fine woolen hair, whereas cast C is from a medium fine wool fiber. Since hair C is larger in circumference it requires more than one scale to cover it and the scales are arranged more shingle-like overlapping longitudinally and circumferentially.

Cast B of mohair fiber shows an epidermis structure quite different from the two wool fibers. The scales hardly overlap, therefore they lay much closer to the stem and the outline is smooth or only faintly serrated. The visible area of the mohair scales is much larger than from the wool scales, therefore we find a higher number of scales over a certain length of the two wool hairs than in the mohair fiber. For quantitative determination the scale formation may be expressed in number of scales per 100 microns or in the visible scale lengths. In mixtures of merino wools with mohair the determination is quite simple as the scale number in 100 microns is 10-11 for wool and 5 for mohair. The long wool and the beard hairs of carpet wools in many instances resemble very much the mohair fiber as the scale number along the outline is between 6 and 8. In such cases the measurement of the visible scale length as proposed by Skinkle* is a good way to be used. He measures the scale lengths (S) in microns of a series of several scales on a single fiber and the width (D) at the same point as the scale lengths. For further verification he uses the value S^3/D.

Variation of S—Scale Lengths

Various Mohair	Various coarse wools
18.1 to 21.6 microns	12.7 to 17.9 microns

*Am. Dyest. Rep., No. 23, Nov., 1936.



A **Wool** **B** **Mohair** **C** **Wool** 500X

Fig. 4—Epidermis Structure.

1. S is above 18 for all mohairs and below 18 for all wools.

2. All but two wools are below 17 and all but two mohairs are 18.5 or above.

3. S^3/D is below 140 for all wools except one, and above 160 for all mohairs except two.

In the identification of a hair as either wool or mohair, the following cases may exist:

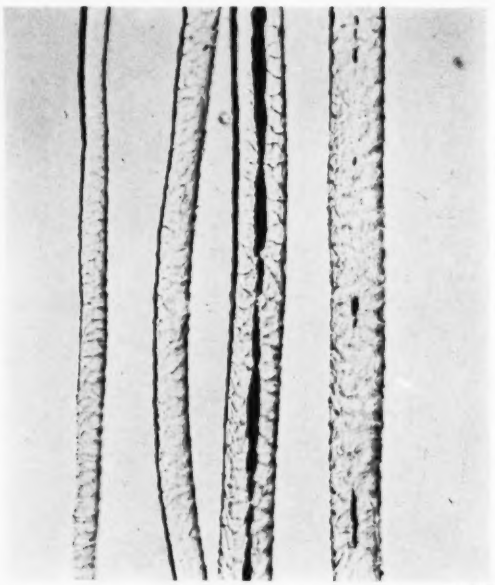
A. The value of S is below 17.0; the hair is wool.

B. The value of S is above 18.5; the hair is mohair.

C. The value of S is between 17.0 and 18.0; the hair is probably wool, verify by calculating S^3/D, if this value is below 140 the hair is wool.

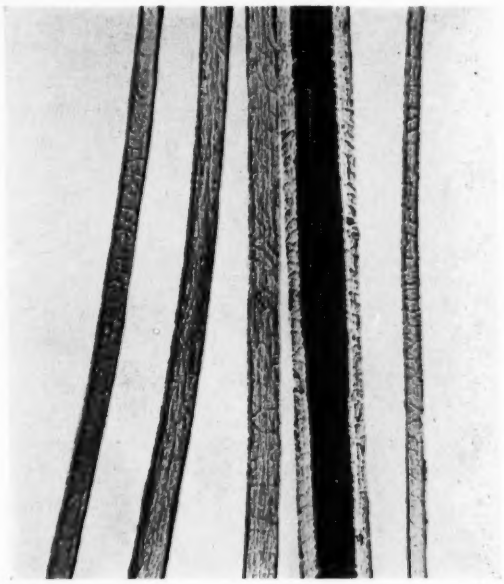
D. The value of C is between 18.0 and 18.5; the hair is probably mohair, verify by calculating S^3/D, if this value is above 160 the hair is mohair.

The method is very tedious and time consuming. To make it practical a medium has to be found which improves the visibility of the scale lines to such an extent



180X

Fig. 5—Longitudinal View of Wool Fibers.



160X

Fig. 6—Longitudinal View of Mohair.

that they are distinct. This is not the case by using mineral oil.

The difficulty in measuring the scale length may be further realized by comparing figure 5 and figure 6. Figure 5 is a longitudinal view of four wool fibers of varying widths. In the two coarse ones you see the third layer in which the medulla is present. As the epidemis is very thin, only approximately two microns thick, we see through it, and we find that the fibers show a little striated appearance, which is caused by the cortical cells below the epidermis cells.

Figure 6 shows five mohair fibers. They are much smoother and show a much stronger striation which is the result of the scales being much farther apart. Here we have one fiber showing the medulla.

CORTEX

To study the cortical cells accurately the epidermis has to be removed which is best done by disintegration of the fiber with the help of bacteria. Burgess* has developed an excellent method for this purpose. The growing bacteria produce enzymes which rapidly break down the scales of the fiber and hydrolize the intercellular substance holding together the single cells of the cortical layer until they split open and fall apart. Figure 7 illustrates such a disintegrated wool fiber. The free cortical cells are 80 to 110 microns in length, two to five microns broad and 1.2 to 1.6 microns high.

There is still some dispute about the presence of a cementing substance. Some claim it is only an intercelullar structure, but I firmly believe there is a glue-like substance between these cells otherwise they would not fall apart thru bacteria action. The mohair fiber has the same cortex structure.

Figure 8. It is interesting to note that in many instances the mohair fiber shows some black crevices, which are air pockets (Vacuoles) between the cortical cells. We will see them a little later in cross-section.

Medullas are totally absent in fine wool (Merino) but in crossbred, English wools and carpet wool, they are frequently present in three types: the fragmental, the interrupted and the continuous. In figure 5 the first two types are represented, whereas the continuous type is seen in figure 6 in the coarse mohair fiber. In mohair the number of medulated fibers is normally below one percent, the continuous type is the predominating one.

CROSS-SECTIONS

Now let us study the cross-sections of wool as illustrated in figure 9. We see clearly in most of the hairs two layers: the epidermis and the cortex. Hair A shows all three layers, with the medula in the center. The wool fiber is not circular, it is more or less oval. and the ratio between the major diameter and the minor diameter usually runs 1 to 1.2 in even wools, or as high as 1 to 1.25 in poor wool.

In fineness, which is expressed as the diameter of the fiber or the width of the fiber, the wool hair varies from 12 microns up to 70 microns in most commercial wools.

Figure 10 shows a cross-section of mohair. Mohair is recognized immediately by a skilled worker because the fiber in general has a high circularity. The ratio between the major and minor diameters is usually 1.2 or lower. The mohair has a dispersion in the diameter from 14 to 90 microns.

In many cases we find hairs with black dots, or little

*R. Burgess, "The Use of Trypsin for the Determination of the Resistance of Wool Fibers to Bacterial Disintegration," Journal, Textile Inst., Vol. 25, p. T289 (1934).

500X

Fig. 7—Bacteria Damaged Wool Fiber Showing Cortical Cells.

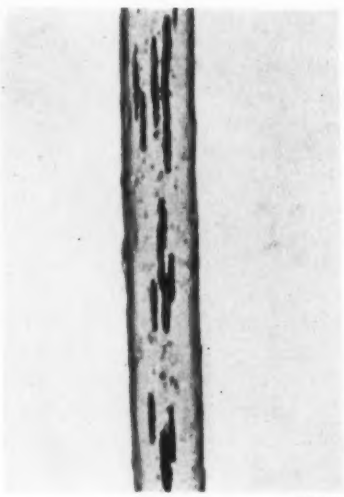


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Fig. 8—Mohair Fiber with Air Spaces or Vacuoles in the Cortex.

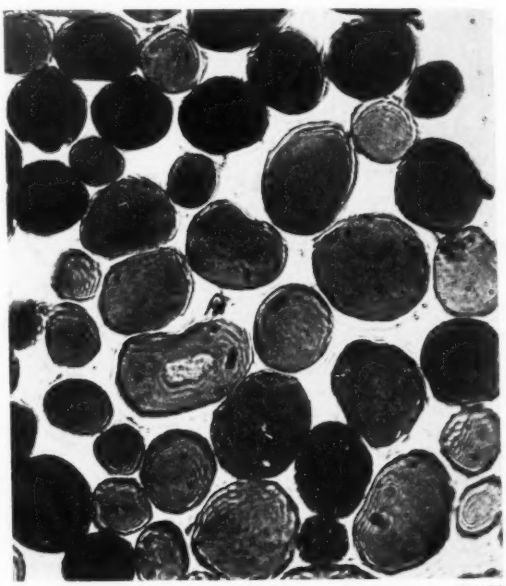

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Fig. 9—Cross-section of Wool Fibers.

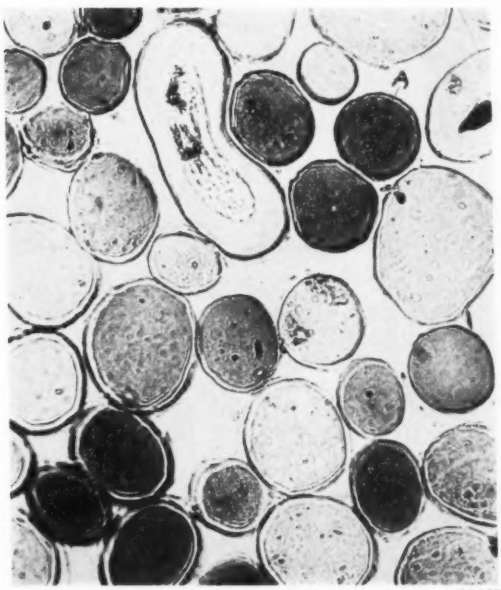

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Fig. 10—Cross-section of Mohair Fibers.

circles, which are caused by the airfilled pockets or vacuoles as already mentioned in describing figure 8 see hair A. The vacuoles are found at random throughout the hair and have a cigar-like shape of various lengths. The percentage of hairs containing airfilled vacuoles varies in large limits. Some mohair samples show below 1% and others nearly hundred percent.

The great objection manufacturers have to Mohair is, according to Hardy* that it commonly contains shorter, coarse, undesirable fibers known as kemp. Besides taking dye poorly, these fibers often cause a loss in combing of as much as about 18 per cent of the original weight of the mohair. In addition to this it is not possible to remove them completely from the good mohair. In wool, kemp fibers are only present in low grades like the carpet wools and China wools.

In some of the best Texas Mohair, especially the kid grades the percentage of kemp is negligent. Kemps are very short (half an inch to two inches long) normally with the natural root end and the tapering tip with a sharp point. They measure from 70 to 200 microns at their largest width and the medulla forms 90% or more of the

*Technical Bulletin No. 35, U. S. Dept. of Agriculture. October. 1927. "Studies of the Occurrence and Elimination of Kemp Fibers in Mohair Fleeces," by J. I. Hardy, Animal Husbandman, Animal Husbandry Division, Bureau of Animal Industry.

fiber. As with other fibers, only the cortical layer absorbs the dyestuff, therefore, the kemp are much lighter in color when dyed together with normal fibers.

The kemp because of its coarseness and structure causes the spinner as well as the dyer much trouble. Fashion has made use of these properties of kemp as they are excellent to produce special effects, for instance a two-tone effect.

CHEMICAL PROPERTIES

Going further to the chemical properties of the two fibers we find that the mohair fiber is more sensitive to various chemicals than wool fibers. First, the composition of raw fibers; as you saw from the Ford pictures, there are various percentages of foreign matter in wool. In mohair we have a much cleaner raw fiber.

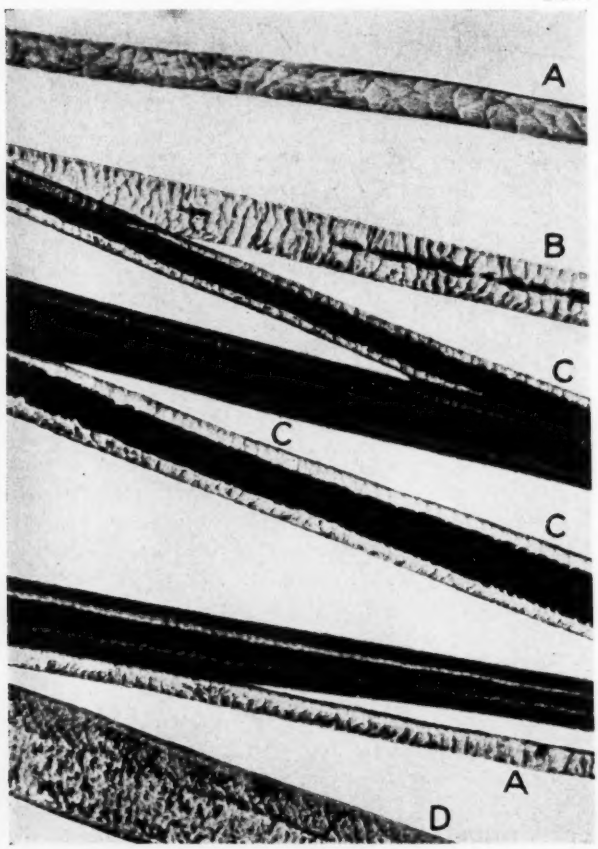
The shrinkage of the various wools or the loss in weight through scouring run from twenty-five to seventy-five per cent. That means there are some wools on the market from which we get, out of a hundred pounds, of raw wool, only twenty-five pounds of usable fiber.

Our domestic Merino wool—the finest wool we have in this country—has an average shrinkage of sixty per cent.

Fig. 11—Good Mohair without Medulla, and Different Degrees of Medullation. A—Good Mohair; B—Partially Medullated Mohair; C—Mohair with Continuous Medullations; D—Coarse, Kempy Mohair.

J. I. Hardy, Tech. Bull. 35, U. S. Dept. of Agriculture

250X



The wool grease content of this wool runs from twenty to twenty-five per cent.

Mohair shrinks only fifteen to twenty per cent in the scouring. Its fat content is normally, in the raw state, four per cent.

I shall not go into details as to the chemical constitution of these fibers. That I will leave to Dr. Milton Harris who is the authority on this matter. Both fibers have as their main chemical compound keratin which contains as its characteristic element sulfur — but not to the extent of 2.2 which is what the Ford film claims. They must have gathered their information from other sources than Dr. Harris, for he found an average sulfur content of 3.66 per cent. The sulfur content of the specialty hair fibers, like mohair, cashmere, and camel's hair, has not yet been properly established.

Dr. Harris is at the present time working on this problem and I hope that he may be able to find that the sulfur content varies so much between wool and mohair that the percentages of sulfur may be used to identify certain specialty hair fibers.

MANUFACTURING PROCESSES

As to the behavior of these two fibers in the various manufacturing processes, I have already mentioned that the sensitivity to various chemicals especially to alkalis and acids is much higher for mohair than for wool.

SPINNING

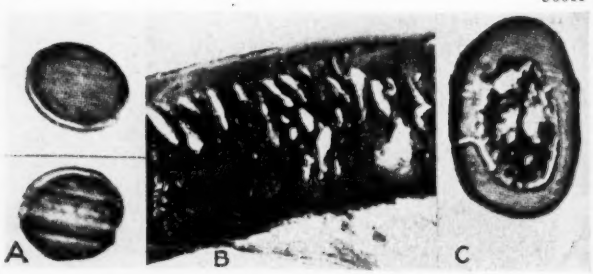
As the Ford film showed, mohair is usually spun after the English system. It is combed. But today, to quite an extent, mohair is spun after the woolen system. This is not so easy because in the woolen system a much shorter wool is used, two inches and below, whereas I mentioned previously, mohair is from five to seven inches long. Therefore, most spinning plants cut the mohair in order to be able to spin a satisfactory yarn.

Another difficulty is that Mohair is very easily loaded with static electricity during the spinning and the moisture content during this process, for mohair mixtures must be carefully controlled and must always be above 12 per cent. The amount of oil needed to help the spinning along is usually only half of the amount for wool because the mohair is slippery in itself.

Fig. 12—Sections of Mohair Fibers. A—Cross-section of Good Mohair; B—Longitudinal Section of Mohair Kemp; C—Cross-section of Mohair Kemp.

J. I. Hardy, Tech. Bull. 35, U. S. Dept. of Agriculture

500X



THE SCOURING AND FULLING OPERATION

Mohair as it does not process any natural krimp and because of its scale formation which make the fiber slippery, shows a considerable lack of felting property. When we have a hundred per cent mohair fabric, we are hardly able to interlock the fibers, as we are able to do with wool.

I must heartily disagree with Ford's picture, on the fulling theory. It is nonsense to show the fibers interlocking as that picture did. I shall have to admit that even in highly modern works such as Margaret Hess's volume "Textile Fibers" and Herman's Technology of Textile Fibers" you still meet such pictures.

The outstanding edges of the wool fibers are so fine that they are never able to interlock. However, they play an important part in fulling.

Fulling is the process by which the fibers in a piece of cloth are made to felt by the application of moisture, pressure and heat. Moisture reduces the elasticity of the wool and consequently its resistance to the power or pressure. By using fulling agents like soap or acid solutions as the moisture carrier, they increase the swelling of the fibers which is followed by the forming of more waves. The continuous pressure applied through the mechanical devices of the fulling machine forces the fibers to move. The interesting thing is they can only move in one direction, namely toward the root, because the outstanding scales work like a fish hook and they prevent the hair from slipping backwards. As the fibers are more or less krimpy they become entangled with each other during their movement as the fulling operation proceeds, ultimately becoming felted together.

Heat, which is produced through the friction between the fibers themselves and between the cloth and the machine parts caused through the pressure applied, speeds up the process. Felting therefore is due primarily to the natural movement of the fibers in one direction and the waviness of the wool.

Mohair because of its flat scale formation is slippery and may move in the root as well as in the tip direction, as the waviness of the fibers is missing the felting property is very poor.

Therefore, in making up mohair fabrics they are mixed with wool fibers to aid the fulling process. They full quite nicely when mixed with wool. Still, the fulling time is usually nearly double that necessary for fulling regular wool pieces.

In some instances the fuller has brought from his machine a longer and wider piece than that with which he started.

CARBONIZING

In the carbonizing process we have to be especially careful with mohair pieces. Mohair pieces are usually very open in their structure and it is therefore difficult, after immersion in the sulfuric acid liquor, to remove the excess acids through vacuum extraction to the point where they will not cause damage. The acid content of the pieces before they enter the burning oven should always be below six per cent. If the acid content is higher than that, the dyer will bring out pieces in which the color appears either as a two-tone effect or as not being dyed through, but showing a spotty appearance because of the reduced affinity of the fibers toward the acid dyestuff.

BLEACHING

Mohair pieces are easily overbleached. Again, the main reason is the open texture, which enables the oxygen of the bleaching bath to attack the fibers much more than in a firmly constructed material, like a fine hard worsted. Mohair fibers are very sensitive to bacteria as are the other hair fibers, such as cashmere and camel's hair. You should never allow mohair pieces to lie around too long in a wet and alkali state. If you do, your fibers will be damaged to such an extent that they will split open, as seen in Fig. 5.

DYEING

From practical experience it is known that in piece dyeing the mohair fiber has less affinity for the dye than wool fibers of the same grade. They dye approximately ten, sometimes twenty, per cent lighter. You will find that the color of the mohair is always lighter than the color of the wool, even when the fibers are dyed with the same recipe. The luster of the mohair is also a partial cause of this action.

Mohair being closely related to wool is dyed with exactly the same dyestuffs and by the same processes used in dyeing wool. It may be dyed in raw stock, as top and in the yarn with Neolan, Palatin, Chrome or vat colors, and in pieces, usually with straight acid colors.

Between the different mohairs we have the same relationship of affinity for the dyestuff as in wools; the coarser the fiber, the darker the shade. The variation between different wools is in some instances even greater than it is between different types of mohair. A mohair with an average diameter of twenty-nine microns, will appear to be about 10 per cent darker than one having an average diameter of twenty-four microns.

To study the actual outcome of a chrome dyeing on mohair and various wools the following recipe to produce a red-orange shade was used:

.72% Diamond Red 3 B, General Dyestuff Corp.
.18% Alizarin Orange R, National Aniline & Chem. Co.
.18% Chromebrown B, National Aniline & Chem. Co.
.18% Pontachrome Yellow R, Du Pont.

The dyeings were made on

1. Texas Kid Mohair—Average 29 microns
2. Texas Kid Mohair—Average 24 microns
3. Monte Video Lamb—Average 26 microns
4. Australian Lamb — Average 26 microns

The strength of the shades judged from the felts made showed that sample No. 1 was the darkest, Nos. 2 and 3 were about equal. Sample No. 4 had a much more yellow cast than all the other three because the staples were very uneven dyed. The main part of the diamond red was absorbed by the upper half of the staples and

the parts nearest to the skin took all the yellow. We, therefore, cannot establish it as a rule that mohair always dyes lighter than the same grade of wool. When mohair is mixed with a much finer wool, the mohair naturally will dye much darker. So you are able, with mohair, to make two-tone effects by mixing them with much finer wool or even with hair fibers like cashmere or camel's hair.

Mohair is also influenced by sunlight while still on the back of the goat, which is proven through its uneven dyeing over the staple length. We have the same phenomenon as in wool, that the tip of the fiber, in its affinity towards various dyestuffs, is changed, in quite a large number of dyestuffs. A good example was this red-orange as described under the chrom dyeing test. The diamond red 3 B is especially sensitive to the exposed parts; the uneven dyed mohair staples had a strong red color in the tip part and the root end was orange. Strong tippy ends were also produced with a green containing:

Eriochromazurol B	.70%
Aliz. yellow 2 G	.30%
Chrom orange 2 A	.15%

The tip part was yellow-green and the main part strong blue-green.

CONCLUSION

In summarizing, we find that wool and mohair are similar fibers. In their origin and general composition they are the same. In their general physical makeup, as presented in the raw and semi-manufactured state, any skilled tradesman should be able with the naked eye to properly identify them through their differences in lustre, length, and waviness as well as softness. In their microscopic structure each one shows certain characteristic formations which should enable the technician to identify both types quite accurately in fiber mixtures. I must admit that only very long experience will enable a man to make a quantitative analysis by measuring and counting the mohair and wool fibers in a mixture, but it can be done.

As a specialty hair fiber, mohair has no doubt achieved its position as the most important specialty hair fiber, due to its beautiful lustre, especially in ladies' coats. It gives to them a more attractive appearance and therefore these coats are much more appealing to the ladies.

DISCUSSION

Chairman Baxter: Ladies and Gentlemen, I am sure we have all enjoyed looking at these interesting slides and listening to Mr. von Bergen.

The meeting is open for discussion and for any questions that you may care to ask.

Dr. Smith: Mr. Chairman, since Mr. von Bergen said that the hairs were not fed through this medula that we see, I wonder if they know how the hair on either a sheep or a human being is fed.

Mr. von Bergen: I have read quite a lot on this subject but I was unable to get a clear answer to it.

Chairman Baxter: At this point I might ask one question, myself.

You spoke of the two different spinning systems, one being the wool system, the other the English system. Is the English system the same as the cotton system?

Mr. von Bergen: No. Don't mix King Cotton with King Wool.

Chairman Baxter: But wool and spun rayons are being spun both ways together.

Mr. von Bergen: The cotton system is similar to the French worsted system, but it varies in many respects from the wool system. The machines are built differently, because cotton is a much shorter fiber. Cotton is less than one and three-quarters of an inch long when it is combed, and we start our combining with the wool fiber above two inches.

Chairman Baxter: But in the mixtures that are being brought into the market today where you have a combination of spun rayons with wool fibers, they are using those two different systems.

Mr. von Bergen: Yes. Then you have, naturally, a similarity of the system.

Dr. Smith: Don't they cut a good deal of the wool fiber so they can spin it on a cotton system with spun rayons? I think they cut it to about an inch and a half in length.

Mr. von Bergen: Yes, that is true.

Mr. Cotton: This fulling operation that you spoke of—you mentioned the use of acids in connection with that. Just what part do acids play in the fulling operation?

Mr. von Bergen: It acts as a swelling agent the same as soap. Sulfuric acid is used, especially in the hat trade, to make the hat felt. Also some mills use it to felt their regular woolen goods.

Chairman Baxter: Gentlemen, are there any other questions?

Mr. Krassner: From the standpoint of keeping qualities, is there any favorable condition in which the wool should be kept; that is, from the standpoint of acidity or alkalinity, what is considered the best degree of acidity or alkalinity for the final product?

Mr. von Bergen: It should leave the mill, if possible, in a neutral state. I would prefer a pH of around 7. If that is not possible with piece dyed goods, dyed with acid colors, they should leave the mill with a pH of around 3. If you would neutralize the regular acid colors—the dyestuff manufacturers are to blame for this—that would throw all these dyestuffs out of the market. (Laughter)

Mr. Freedman: Mr. Chairman, I would like to ask Mr. von Bergen whether the dyed wools increase in acidity with age.

Mr. von Bergen: Not to my knowledge. If they are properly stored the acidity does not increase. If you hang your woolen suit or other clothes on the roof of a building and expose them to the sun, you will find that the acidity will increase, because the keratin substance is oxidized, the sulfur is oxidized, as far as sulfuric acid. The wool may

be neutral at the start, but you might find anywhere up to one per cent of acid after exposure of half a year or a year.

Chairman Baxter: Are there any other questions?

Mr. Charruthers: Mr. von Bergen, you said that in piece goods dyeing the mohair fiber usually has less affinity than wool fiber of approximately the same grade. Are there some differences in skein dyeing and piece goods dyeing of wool fiber that might be interesting?

Mr. von Bergen: There are no differences. Many of the mohair knit yarns are dyed with acid colors today. Most of the knit yarns are dyed with neutral colors which are so called "fast to sea water and light." As a rule they are excellent for the dyeing of yarn, knitting yarn especially. I haven't yet seen a bathing suit made out of mohair. I don't know how it would work out. I know it would be very shiny, however. (Laughter)

Mr. Keller: In felting, isn't that action assisted by the softening of the scale somewhat to make them gelatinous so that they partially stick together?

Mr. von Bergen: If it goes so far in the wool fiber that they stick together then we might as well say goodbye to the fiber because the fiber will be damaged to such a degree that after the drying it will feel very harsh. That is what happens in over-bleaching. And some fibers may be damaged to such an extent that they become slimy and they start to stick together. Actually, however, we have no more keratin substance left; we have something else; we have an overoxidized product which no longer has the physical and chemical properties of the real wool fiber.

Mr. Keller: Other workers have stated that the action of gelatinizing is carried on to a small degree, not so far as you just described.

Mr. von Bergen: I don't believe in that theory so much.

Mr. Keller: That theory has been advanced and quite a few believe in it.

Mr. von Bergen: Who was the authority?

Mr. Keller: I just don't remember the name, but they made that study and advanced that theory.

Mr. von Bergen: In the same way, a German, Prof. Hess, has advanced the theory that the cortical cells have in their middle a liquid which allows the wool fiber to stretch to a certain percentage. He tries to explain the theory of the X-ray structure. Neither do I believe in that—that part of the cells are in the middle liquid or in a syrup-like condition.

Mr. Mellon: You mentioned that a wool material that has been fulled and allowed to stand would mildew. Does that condition exist in acid fulled goods?

Mr. von Bergen: If the pieces are in an acid state they are usually less sensitive because the type of bacteria which acts on the wool material and the keratin substance grows best under an alkaline condition.

Mr. Mellon: But it is possible——

Mr. von Bergen: It may be possible that if the pieces are in a heavy pile, with not much air allowed to get to them, they may develop certain bacteria, but in the seventeen years that I have been in the wool industry I have never come across such a case.

Mr. Mellon: In other words the stain appearing to be mildew in those conditions would most likely be something else?

Mr. von Bergen: Yes.

Mr. Schuman: Just what is the objection to a little oil in the final water?

Mr. von Bergen: The objection does not come from the manufacturer; it comes from the customer.

Mr. Schuman: What is the objection on his part?

Mr. von Bergen: Because if you apply a half per cent of anywhere up to a per cent of any sulfonated oil on your wool material it gives it a sticky feeling and any customer who has the real wool touch in his fingers can tell it right away.

Mr. Schuman: Does that go for mineral oils, too?

Mr. von Bergen: Any type of oil. Sulfonated oils in this respect are particularly bad. When salesmen come up and try to convince me that the wool people should use barrels and barrels of oil, because the cotton and rayon people do, I always say, "Nothing doing!" (Laughter.)

Dr. Smith: I should like to ask whether any of these moth-proofing treatments have been successful as a permanent means of keeping one's clothes from disappearing? I know that a good deal of work has been done on moth-proofing and I wondered what the practical outcome of it all was.

Mr. von Bergen: That is a very delicate thing to talk about because the average wool manufacturer likes to put out new goods; he doesn't like to have his customer keep his woolen goods too long. (Laughter.)

I think, particularly in the carpet trade, that has proven quite successful. There is no doubt about it.

The main trouble with all of these moth-proofing treatments is that they are difficult to apply between processes in the mill. The greatest damage to the manufacturer occurs during the storing of partly manufactured woolen products like roving and yarn and raw pieces. To be one hundred per cent effective the moth-proofing agent has to penetrate each single fiber and to accomplish this you have to apply them in strong solutions and with heat. There is still plenty to be done on this subject. If the industry could turn out a product which could be used with the oil emulsion I think they could make plenty of money.

Mr. Schmidt: From the wool manufacturing standpoint we have heard a lot about dyeing of kemp. We have gone into the problem quite seriously and have in some cases been able to dye kemp to the same degree of shade as the background wool in the blend.

I should like to know what Mr. von Bergen's experience has been with the dyeing of kemp to match the wool in the blend?

Mr. von Bergen: I was never able to do that trick. (Laughter.)

MEETING, NEW YORK SECTION

THE last regular monthly meeting of the New York Section was held on Friday evening, April 23rd, 1937, at the Swiss Chalet, Rochelle Park, N. J., at 8:00 P. M. The usual informal dinner was held at 6:30 P. M. preceding the meeting.

Mr. Robert Zametkin of Pilgrim Piece Dye Works spoke on "Some Aspects of the Scouring of Rayon."

The second speaker, Dr. D. H. Powers of Rohm & Haas Company, delivered a paper on "Synthetic Resins and Their Application as Textile Finishes."

Both talks were unusually interesting and many questions were asked by the members attending the meeting.

A rising vote of thanks was extended to both speakers.

For the next election of officers, the following Nominating Committee has been selected:

Mr. Henry Herrmann, Chairman
Dr. Joseph F. X. Harold
Mr. Ephraim Freedman

It was also planned to have our annual outing of the New York Section at the North Jersey Country Club, Paterson, N. J., during the second or probably the third week in June. Further details regarding this outing will be furnished to the AMERICAN DYESTUFF REPORTER by the Outing Committee.

Dr. J. E. Meili referred to our next meeting, which is to be held on Friday, May 21st, 1937, at the Chemists' Club, New York City. Being the final technical meeting for the season, he assured us we will again hear from two excellent speakers.

There was a total attendance of ninety-five (95).

Respectfully submitted,

P. J. KENNEDY, *Secretary.*

MEETING, PHILADELPHIA SECTION

THE fifth of the 1936-1937 season meetings of the Philadelphia Section was held Friday, April ninth, at the Hotel Dupont, Wilmington, Delaware.

Brief reference was made to the annual outing which is to be held on May fourteenth at the White Marsh Valley Country Club in Philadelphia.

It was announced that the committees for the National Convention which will be held on December third and fourth had been organized and that the principal officers were: Elmer C. Bertolet, General Chairman, Alban Eavenson, Vice-Chairman, and Richard M. Ritter, Secretary.

At the suggestion of the Nominating Committee for local officers, it was decided to postpone the election until the first meeting of the next calendar year and to amend the By-Laws, to make this future procedure.

Charles A. Seibert is the Section's member of the Nominating Committee for national officers.

Mr. Henry E. Millson, a member of the Section, presented an excellent talk on the subject of "Queer Forms of Light." His talk included reference to the cosmic, gamma, infra red, radium, ultra-violet, X and other rays, with a description of their properties and uses. Fluorescence and phosphorescence were illustrated by a miniature estate and garden colored with phosphorescent paint and numerous dolls and a male quartet costumed in garments colored by this means, as well as by colored skeins and cloth embroidered with colored patterns, part of which absorbed and other parts of which reflected light from an ultra-violet lamp and from ordinary electric light bulbs. Mr. Millson also exhibited a glass case in which he had mounted a variety of mineral ores which assumed attractive colors under the ultra-violet lamp, and prepared a large flask of liquid which emitted cold light.

Mr. Robert A. Morris for the Dupont organization exhibited a sound film entitled "The Wonder World of Chemistry," which illustrated and described a wide variety of products manufactured by Dupont.

The usual informal dinner, at which 93 were present, preceded the meeting, while 118 attended the meeting.

Respectfully submitted,

CHARLES A. SEIBERT,
Acting for the Secretary.

MEETING, LOWELL TEXTILE INSTITUTE STUDENT SECTION

THE Lowell Textile Institute Student Section held one of its monthly meetings on Monday, April 26, 1937 at 2:30 P.M. Mr. Edward B. Bell of the Calgon Co. gave an interesting talk and demonstration on "Calgon and its applications to the textile industry."

Respectfully submitted,

HUGH F. CARROLL, *Secretary.*

CLOTH FOR CROCK METER

Squares of bleached white cotton cloth of the exact size and specification recommended in the 1935-36 Year Book for use with the Crock Meter are ready for distribution at the following prices:

Packages of 100	**$ .20 postpaid**
3 packages	**.50 postpaid**
7 packages	**1.00 postpaid**

(Smaller amounts may be paid for in United States postage stamps). They may be obtained from L. A. Olney, Lowell Textile Institute, Lowell, Massachusetts.

UNEMPLOYMENT REGISTER

Members of this association, who are without employment, should forward to the secretary a statement as to their qualifications and experience. This information will subsequently appear on these pages with an identifying key number. Employers are also requested to file with the secretary or the American Dyestuff Reporter any vacancies which may occur in their businesses.—H. C. Chapin, Secretary, Lowell Textile Institute, Lowell, Mass.

Key: A—Laboratory and research; B—Dyeing or printing; C—Finishing; D—Sales; E—Instruction; F—Executive.

NOTE: **PERSONS WHO HAVE OBTAINED EMPLOYMENT SHOULD NOTIFY THE SECRETARY OR THE AMERICAN DYESTUFF REPORTER AT ONCE.**

Prospective employers may file vacancies either with the secretary or the American Dyestuff Reporter.

A-1

Education—B.T.C., Lowell Textile Institute.

Experience—Two years as chief chemist in cotton mill. Experienced on direct, vats, naphthols, sulfur, basic and developed colors. Two years' experience in protein, fat fiber and mineral control in grains and animal feedstuffs. Age 28.

A-B-1

Education—Graduate chemist and colorist from a leading textile institute. Speaks French fluently. High standing at school. Awarded 1st prize in chemistry. Member of honor society.

Experience—Knowledge of most processes of textile manufacturing and some experience in woolen and worsted piece and stock dyeing and color matching. Presently employed in other department but wishes to get into laboratory or dyehouse.

A-B-5

Education—Graduate of the University of Lausanne, Switzerland. Doctor's degree in Chemistry. Knowledge of French and German.

Experience—Eleven years with large bleaching, dyeing, printing and finishing plant as assistant Chemist and then Chemist in charge of the Laboratory. Experience in dyeing and printing cotton and rayon fabrics; research and analytical work. Woman.

A-B-7

Education—Evening school in textile dyeing.

Experience—2 years laboratory in dyehouse; 9 years dyer and foreman on hosiery, ribbons and rayon; 2 years assistant to superintendent. Can handle help efficiently. Desires position as supervisor or demonstrator of dyestuffs. Age 30; married. Prefers vicinity of New York.

A-B-C-1

Education—B. S. in Chemistry, Massachusetts Institute of Technology.

Experience—7 years with a prominent worsted mill as assistant chief chemist, chief chemist, and superintendent of dyeing and wet finishing. Thoroughly familiar with chemical problems of worsted industry. Age 33; single. Location unimportant.

A-B-C-2

Education—Graduate of Lewis Institute of Engineering of Chicago and graduate of Philadelphia Textile School (Chemistry and Dyeing department).

Experience—Has had extensive experience as assistant chemist and colorist in silk printing, dyeing and finishing; also dyeing raw stock wool; and dyeing and finishing cotton and rayon. Age 30; married; references.

A-B-C-3

Education—Graduate, Chemistry and Dyeing Course, Lowell Textile Institute, 1934.

Experience—Has experience as chemist; dyer of union knit goods (cotton and woolen); experienced bleacher on both. Has handled Tube-Tex processing on cotton and rayons. Single; will go anywhere.

A-B-C-D-1

Education—B.S. in Chemistry, Massachusetts Institute of Technology.

Experience—Combination of plant and laboratory work pertaining to bleaching, dyeing, printing, finishing of cotton, wool, artificial silk. Familiar with wool scouring; sizing of cotton, wool, rayon warps; analytical work; some experience in the manufacture of soaps, finishing compounds and wetting agents; technical service and sales work; paper mill experience; age 44; married; two children.

B-3

Experience—Foreman piece dyer for the past 21 years. Can dye the following: celanese, rayon, cotton backs, wool, silk and mixed fabrics. Has knowledge of finishing and laboratory work.

B-4

Experience—Foreman dyer in charge of ribbon dyeing for 20 years. Experienced on silk, cotton, rayon, acetate yarn. Age 41; will go anywhere.

B-F-1

Experience—As executive had charge of the dyeing of ribbons and piece goods for 6 years; spun silk yarn, fast and resisted dyeing for 8 years; hosiery for 12 years. Has been quite successful in all three of these mills. Age 50 married. Will go anywhere.

F-1

Education—Graduate of School of Textiles, Saxony (1925). Graduate of School of Commerce of University of Berlin (1928).

Experience—Worked in various departments of textile mills as worker, later as a supervisor. Familiar with the production, calculation and management of manufacturing. Thirty years old; unmarried.

MEMBERSHIP

May 1, 1937

	Active	*Junior*	*Associate*	*Student*	*Total*
Northern New England	246	27	27	3	303
Rhode Island	205	28	20	3	256
New York	341	28	40		409
Philadelphia	259	36	30	1	326
Piedmont	177	28	33		238
South Central	33	3	4	1	41
Southeastern	37	2	11	5	55
Mid-West	125	8	13	1	147
Lowell Textile Institute				11	11
North Carolina State College				5	5
Philadelphia Textile School				25	25
No Section	43	6	6		55
	1,466	166	184	55	1,871
Corporate					29
					1900

HAROLD C. CHAPIN, *Secretary.*

ANALYTICAL METHODS

The Council has authorized the republication of the "Analytical Methods for a Textile Laboratory" in the 1937 Year Book. The committee in charge of this section will be glad to correct any errors or omissions in these methods as published in the 1935-36 Year Book. The members of the A. A. T. C. C. are therefore requested to review these methods and send to the chairman of this committee not later than March 15, 1937, any suggestions for the improvement of the existing methods or any new methods which seem suitable to include in this section.

Walter M. Scott, Chairman,
857 Boylston Street,
Boston, Massachusetts.

REPRINTS

Analytical Methods

Reprints of the Analytical Methods as printed in the 1935-6 Year Book are now available from the secretary of the Association for $.75 per copy postpaid.

CALENDAR OF COMING EVENTS

Meeting, New York Section, May 21, 1937, Chemists' Club, New York, N. Y.

* * *

Outing, New York Section, North Jersey Country Club, June 11, 1937.

* * *

Summer Outing, Piedmont Section, Ocean Forest Hotel, Myrtle Beach, S. C., June 25 and 26, 1937.

* * *

Annual Meeting and Convention, December 3 and 4, Bellevue-Stratford Hotel, Philadelphia, Pa.

AMERICAN
DYESTUFF
REPORTER

A. P. HOWES
Publisher

LOUIS A. OLNEY, Sc.D.
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RESEARCH REPORTS

BEGINNING with the issue of July 12th the reports of the research associates of the American Association of Textile Chemists and Colorists will appear quarterly in the Proceedings of the Association. Further reports are tentatively scheduled for publication in the issues of October 4th and the first issue of January, 1938. Valuable as these reports are, it is hoped to make them of additional importance to members by concentrating their publication in four quarterly issues during the year. This, it is believed, will make them more readily available for readers for reference purposes. For a complete record of the accomplishments of the research associates these quarterly research reports should prove exceptionally valuable.

SUPPORT OF RESEARCH

PRACTICALLY all of the textile research in this country has been financed by grants from foundations together with contributions from the manufacturers of machinery, dyestuffs and specialties, with very little money actually contributed by the mills themselves. This is a strange situation inasmuch as the work which is being done has as its purpose to benefit the textile mills. Speaking before the Ontario Section of the Canadian Association of Textile Chemists and Colourists on this subject, Dr. R. E. Rose, past president of the American Association of Textile Chemists and Colorists, said in part:

"It is not too much to say that in proportion to its income the textile industry of the United States is supporting practically no real research, and is not undertaking it individually. This is offset to some extent by the fact that the industries supplying the fabricators of textiles with equipment, synthetic fibers and auxiliary materials are very active. But this can never take the place of investigation carried out for the welfare of those who should be most interested,—the mill owners,—with funds coming from the industry. I do not wish to imply that the industry will perish because it refuses to buy gold dollars for fifty cents, as it can by investing in research, but I do state categorically that the result will be very detrimental, will prevent the industry from realizing many economies and new developments and will render it less able to withstand shock.

"To you I say these things because I feel that your problems are in no small measure the same as ours and I want you to know that we feel that our most important task is to arouse the leaders of the industry to the need for real research. So far we have not succeeded, but we have, none the less, formed a nucleus around which those who appreciate research have gathered. We have done more than that; we have initiated and carried to a successful conclusion problems calling for the determination of facts and their evaluation in terms of usefulness in the mill. We have proved to those willing to be reasonable that research does in reality pay its way; that exact knowledge of the right kind is never costly no matter what it may cost."

There are a few mills which are aware of the possibilities in textile research and have contributed to various projects but the great majority have not. The work which has been done by the various research organizations should have proven to the textile industry that research pays real dividends and it is to be hoped that the mills will soon recognize the value of research by contributing to the research projects.

ANNUAL MEETING

THE Annual Meeting of the A.A.T.C.C. will be held this year under the auspices of the Philadelphia Section on December 3rd and 4th, with headquarters at the Bellevue-Stratford Hotel in Philadelphia. Word from this Section indicates that committees have been appointed and are already at work on the many details of providing a successful meeting and convention for the members.

The principal officers for the convention will be: Elmer C. Bertolet, General Chairman; Alban Eavenson, Vice-Chairman, and Richard M. Ritter, Secretary. Under the leadership of these men there is no doubt but what the Philadelphia meeting will rank with the best.

Coincident with the Annual Meeting, the REPORTER plans to have ready its Second Annual Wet Processing Review Number, reviewing the work which has been done in the past year in the field of textile wet processing. Judging from reports our first review number was well received and it is our intention to make the future issues even more valuable to our readers.

TECHNICAL NOTES FROM FOREIGN SOURCES

(Continued from page 270)

The Present Status of, and Viewpoints Regarding, Substantive Dyeing

Prof. Dr. W. Weltzien and Dr. Karin Schulze—Monats. f. Seide u. Kunstseide 40, 335 *and* 381 (1935).—The second section of the above paper (the first part has already been noted in these columns) deals with substantive dyestuffs in solution (a discussion of the physical chemistry involved), and the process of dyeing, and contains three graphs and one table, dealing with the problem of equivalence of absorption of five different dyestuffs upon cellulose, the dependence of equivalent absorption upon the concentration of electrolyte, and the relation between diffusion constant and concentration of electrolyte; the table covering the absorption of dyestuffs in equivalents and half-value periods in reference to temperature.

The third and concluding section (p. 381), including three figures and one graph, is devoted to theoretical discussions.

The object and nature of the whole paper is that of a general survey of the topic as a whole, and a discussion of some fundamental factors to be considered in summarizing the process of substantive dyeing as a whole.

Nitrogeneous Substances in Cotton and Flax

Dr. Franz Barlet—Monats. f. Seide u. Kunstseide—41, 25 (1936).—A review of the work done in recent years, largely by Tschilikin, upon the occurrence of certain kinds of natural impurities of nitrogenous nature, in raw cotton and flax.

The raw fiber, having as its fundamental constituent cellulose, contains also resinous, fatty, and waxy substances, coloring matters, ash, and lignin, and also substances containing nitrogen, which are generally referred to the protein group. These latter components are largely removed by kiering, the lignin being removed by chlorine bleaching. In kiering, the following process takes place: saponification of all glycerides, only slight saponification of waxy substances (most of which remain on the fiber unaltered), formation of sodium salts of the products of decomposition of the glycerides and of the nitrogenous substances, formation of alkaline-decomposition products of pentosanes, hexosanes, etc., and, chiefly, the emulsification of the unsaponifiable wax-like substances. Tschilikin concludes, therefore, that kiering is not merely a simple saponification process.

The accompanying impurities in raw cotton, contrary to the case with flax, are mostly of wax-like nature and hardly saponifiable, and in the boil-off liquor are mostly found in the unaltered state, as they existed upon the fiber. Only glycerides which were present are saponified. They are present in such small quantities that the alkali salts of their fatty acids, therefore, that is, soaps, would hardly be present in sufficient quantity to account for the emulsificative removal of the waxy substances, which are emulsificatively removed.

Tschilikin has isolated a new organic acid from the boil-off liquors. It contains nitrogen, and from its nature must be ascribed great influence in the boiling-off process. Often, in kiering, emulsifying agents are added to the liquor—soap, Turkey-red oil, etc. In view of Tschilikin's results, such additions may be diminished in quantity or even omitted entirely without detriment, since there are present in the liquor good emulsifying agents, originating in the impurities of the fiber which is being processed. This new acid, a black substance, is regarded as the cause of the color and odor of the kier-liquor. Tschilikin gives it the name "amino-acid L." In the pure condition it forms a black powder, insoluble in water, easily soluble in alkalies, both caustic and carbonate, and in 80 per cent acetic acid. Its color, in solution in alkalies, is deep brown; if the solution is acidified, the acid precipitates as a black powder, though some of its remains in colloidal solution. It possesses a definite acid number and saponification number, and is, then, apparently a homogeneous substance, not a mixed or impure substance; and according to Tschilikin is an amino-acid. The details of its isolation by T. are of interest; the total precipitate gotten from kier-liquor by acidification contained:

64.2%	extractible with benzine easily
7.3%	extractible with benzine difficultly
2.2%	extractible with ether
5.3%	extractible with alcohol easily
2.5%	extractible with alcohol difficultly
0.19%	extractible with chloroform
7.5%	insoluble in organic solvents, soluble in alkalies (the black acid)
10.0%	"loss."

The material extracted from vegetable fiber by the action of caustic liquors has, up to now, been designated as "pectin-substances." But Ehrlich has shown that the true pectins, by hydrolysis, yield methyl alcohol, acetic acid, arabinose, galactose, and galacturonic acid. He holds the incrustive matter in the vegetable fiber to be composed of pectin, and goes so far as to ascribe the formation of lignin and the humus substances to its presence and alteration during growth. But, from Tschilikin's work, "amino-acid L" must be referred to a different group of substances. This product of T.'s is obtained (see above) by acidifying the boil-off liquor, a precipitate being obtained which for the most part consists of the amino-acids of a dipeptide character. This material is dried and extracted successively with benzine and with ether, which remove wax-like sub-

stances. The residue is partly soluble in alcohol, the insoluble portion containing the amino-acid. Or, alternatively, the boil-off liquor, after acidification and filtration, is made weakly alkaline, and then evaporated, when, upon acidification, the black amino-acid precipitates. This method would give only a portion of the total black acid, but more directly. In any case, the black amino-acid was purified by dissolving in 80 per cent acetic acid, and fractionally precipitated by dilution with water.

There are four possibilities, by way of explanation, for the nature or origin of the acid. T. considers that it is probably not a derivative of chitine (which is known to occur in the vegetable kingdom). He considers its origin from albuminoid substances by hydrolysis most probable. It does not seem probable that the substance can be connected with lignin. The most plausible explanation would link it with linomarin, a nitrile-glucoside; but this shows no similarity or affinity to the substance under consideration. T. consider the amino-acid to be related to alanine, carrying two methoxyl groups in the ring. The similar substances obtained from flax he considers to be a butyryl-dimethyl-phenylalanine.

After kiering, bleaching usually takes place, by means of chlorine in one form of another. Higgins believes that the proteins are all removed completely from the fiber by kiering alone, but Tschilikin controverts this view, and adds that the undoubted formation of chloramines, and the subsequent breaking down of these with liberation of HCl, is the reason for the fiber suffering in the process. The closing part of the paper gives some interesting information and advances some hypotheses regarding the whole chloramine question.

New Light-Fastness Types for Textile Dyeings

Prof. Dr. P. Krais—Monats. f. Textil-Ind. 51, 242 (1936).—The series of types of blue wool-dyestuffs, recommended in the 6th edition (1932) of the "Standards" of the Fastness Commission of the Society of German Chemists, for the testing of light-fastness, has been well received in practical circles, and has appeared in the 7th edition of the above publication, with one slight change (Type V with 1.0 per cent instead of 1.3 per cent of Cyananthrol RX).

In the effort to improve still further the scale of light-fastness as at present employed, it has been found necessary to adopt some alterations which the Fastness Commission have worked out. This altered scale of fastness is now being brought into use as standard; as the previous one, it is adapted for the determination of the fastness to light of all kinds of dyed textiles.

The new types are as follows:—

Type I—0.8 per cent Brilliant Wool Blue FFR extra.
Type II—1.0 per cent Brilliant Wool Blue FFB extra.
Type III—1.2 per cent Brilliant Indocyanine 6B.
Type IV—1.5 per cent Wool Fast Blue GL.
Type V—1.0 per cent Cyananthrol RX.
Type VI—3.0 per cent Alizarine Light Blue 4GL.
Type VII—3.5 per cent Indigosol O6B.
Type VIII—3.0 per cent Indigosol Blue AGG.

From September, 1936, on, swatches of the new types can be obtained from the author at the cost of postage (foreign countries 85 pfennigs). Type VI is dyed in the same manner as Type V. As to all other matters, the same rules hold good as in the 7th edition of the "Standards" ("Verfahren, Normen, und Typen").

For the sake of uniformity in tests, it is recommended that those interested secure the type dyeings, prepared by the I. G. Farben-Industrie A.-G. laboratories, from the author, as the present chairman of the Fastness Committee.

(The address of the author is, "Prof. Dr. P. Krais, Dresden A 24, Kaitzerstrasse 7, Germany.")

Behavior of Regenerated Cellulose ("Viscosezellwolle") Toward Sodium Hydroxide

O. Succolowsky—Monats. f. Textil-Ind. 51, 125 (1936).—The statement is still often met with, that synthetic cellulose fibers (viscose and cupro rayons) behave toward chemical reagents exactly as the natural cellulose from which they have been prepared; for example, that by the action of caustic alkali solution the artificial fiber undergoes the same alterations as natural cotton which has been transformed into cellulose hydrate. The author states that, according to his own exhaustive studies, this is not the case, or that, at least, the scope of this view must be considerably limited. It can be held as true only in reference to the network of crystalline cellulose within the fiber, and not to the fiber as a whole; and, even with this reservation, certain differences exist in the behavior of the natural and of the artificial fiber. The author proceeds to summarize general facts regarding the two sorts of fiber, and the action of various agents upon them.

The cell-wall situated about the lumen of the cotton fiber is composed of several concentric lamellae, consisting chiefly of cellulose, and surrounded, in the raw fiber, by a membrane, the so-called cuticle. In the lamellae exist the crystallo-cellulose portions of the fiber, those detectible by X-ray examination, making up, in favorable cases, as much as 70 per cent of the total cellulose substance, and presenting, according to X-ray analysis, a quite definite orientation, definite in reference to its component parts and in reference to the axis of the fiber. The remainder of the cellulose content surrounds the crystallite portion in the form of more or less unorientated filar molecules. Through absorptive processes the filar molecules can be "loosened up," and brought into a more separated relation to each other. This process, known as intermicellular swelling, is to be regarded as the first step toward the process of solution. With natural fibers, it brings about a strong increase in volume at right angles to the axis of the fiber, accompanied by a shortening of the length of the fiber. The filar molecules do not, therefore, surround the extended crystal-

lites uniformly, but are concentrated upon the longitudinal faces of the crystallites. The stability of the fibrous structure in chemical reaction, and our views regarding the principal valence chain-structure, are well in accord with this view.

In the transformation of natural cotton into cellulose hydrate, which, for example, takes place in mercerizing, the above structural condition of the fiber remains largely as it was. But the artificial fiber, produced by the viscose or cupro process, though it also consists of cellulose hydrate, displays quite essential differences.

In the process of solution and spinning, obviously the various components of the cotton (or natural cellulose) fiber remain as components quantitatively. In the solution, there will be the crystallites and filar molecules, only no longer definitely orientated as to each other. The filar molecules do not pass to crystallites. In the spun fiber, then, the components are still the crystallites and the filar molecules, but not necessarily, nor certainly, except in a most casual way here and there, possibly, in the original form of arrangement. The original orientation has been destroyed, and is certainly not reproduced in the new fiber. The crystallites are no longer parallel to the axis, and are apparently, from X-ray study, surrounded on all sides by the filar molecules, which likewise are, if the phrase may be allowed, arranged in a disordered manner.

This new arrangement of the components of the fiber in relation to each other influences the process of swelling in a characteristic way. The filar molecules, which now lie between the micelles as well as elsewhere, upon swelling bring about an increase in length of the fiber, which is not the case with the natural fiber. Further, as a result of the increased content (?) of the amorphous part of the fiber, swelling in general takes place to a greater extent. Stretching and tensile strength are therefore affected.

The lamellar structures in the natural fiber prevent dissociation of the crystallites, which are, so to speak, tightly packed between them. The lamellae failing in the synthetic fiber, this retention of the crystallites in a definite arrangement is no longer possible.

As to the question of the outer membrane or cuticle of the fiber, in the natural fiber its nature is of a different order from that of the interior of the fiber, while in the synthetic fiber the case is otherwise—merely an ordinal difference. As the spinning fluid emerges from the spinnerets, the surface of the jet is at once coagulated, and begins to assume a solid condition, still elastic, which incloses the still uncoagulated spinning fluid within. As the process continues, this outer membrane is subjected to stretching as it is further coagulating, while still in a plastic state, and the crystallites are caused to assume for the most part the desired axial direction. But, as to the still fluid content of the fiber, as they in turn coagulate from without inward, they are less and less subjected to this stretching (which will now be mostly over, when the fiber has come to its final external state) as the coagulation proceeds to the core, and so the interior of the fiber, finally solid, does not exhibit the orientated structure, which is displayed in the cuticle (this title is used for the outer membrane of either kind of fiber, as a general term.)

It is interesting to note that the relation between degree of orientation within the fiber and the "solidity" of the artificial fiber, in the dry state, do not bear a general relation to each other, as might have been expected. In view of the above, it is easy to see why a coarse fiber would possess less tensile strength, relatively, than one of finer nature, for, in the finer fiber, the cuticle, first forming in the coagulative process, and under tension taking on internally an orientated structure, would make up more of the total of the fiber than would be the case with a finer fiber. In the wet condition, however, this difference in some ways is compensated; in fact, a more or less regular ratio has been determined between degree of orientation within the fiber, and breaking-strength when wet, for all titers.

Now, as to the absorption of caustic alkalies, the artificial cellulose fiber, containing a higher percentage of unordered cellulose substance, and its more easily accessible micellular surface, will take up the caustic liquor more rapidly. The alkali-adsorption isotherm rises rapidly, and attains a point almost that of the alkali-concentration requisite for the formation of alkali-cellulose. The whole aspect of the curve is that of an adsorption isotherm.

In the natural fiber, the formation of sodium-cellulose goes on gradually, the reaction proceeding from lamella to lamella, in dependence upon the concentration of the surrounding solution. Before the change has taken place completely in the inner part of the fiber, X-ray study shows no uniform fiber-diagram, but a mixed diagram of raw cellulose or cellulose hydrate, and sodium cellulose. If the occurrence of the mixed diagram actually depends upon the biostructure of the fiber, then an artificial fiber, which can exert no structural influence upon the process, would have to react completely and almost at once, to the point at which the formation of sodium-cellulose crystallites is possible. This has been proved experimentally to be the case.

When sodium-cellulose from the artificial fiber is treated with more and more dilute caustic solution, its behavior is like that from the natural fiber. But the regeneration of the sodium-cellulose to cellulose hydrate takes place completely in a short time and at room temperatures, merely by washing with water, while in the mercerization of the natural fiber hot water has to be used in order to bring about the change within a time-interval short enough for technical practice; and the final traces of the alkali have to be removed by scouring.

Other interesting points, too, are discussed.

OBITUARY

JAMES PURCELL

JAMES PURCELL of Boonton, N. J., a printing expert with the National Aniline & Chemical Co., Inc., of New York, died on May 2nd of a heart attack in the Morristown Memorial Hospital. He was formerly a textile mill superintendent. At the time of his death he was 42 years old.

He was a native of Webster, Mass. and was graduated from the Lowell Textile Institute in 1916.

He is survived by his widow, two daughters, his mother, five sisters and a brother.

• GEIGY RELEASE

Geigy Company, Inc., 89 Barclay St., New York, announces release of a circular describing the following product:

Erio Anthracene Brilliant Blue BRL—a further addition to this range of colors. The new product belongs to the class of fast to light level dyeing acid colors and yields a blue which is brighter, redder and clearer than former brands. It is stated that it is suitable for use, not only as a self color, but also in combination with similar products for producing a great variety of fast to light fashion shades on wool of all descriptions. It is further stated that it can also be used for the dyeing of wool-silk when shades of good solidity are obtained and also for the dyeing of real silk, weighted and unweighted. It is claimed that the new dyestuff withstands chrome fairly well, the shade becoming slightly greener and duller, and in consequence it can be used for the shading and brightening of chrome dyeings.—Circular No. 930.

• ADDRESSES ALUMNI

George Walker, principal of the New Bedford Textile School, was a speaker at the banquet of the Textile School Alumni Association of New York City, which was held in the Bristol Hotel during the week of April 19th. Mr. Walker outlined the many advantages of a strong alumni association and suggested ways in which such an organization would benefit the school in general as well as the alumni themselves. Many of those attending the banquet indicated their intentions of returning to the school for the annual alumni clambake which will be held on Saturday, June 12th, the day after graduation.

• DYESTUFFS

The March, 1937, issue of DYESTUFFS, published quarterly by the National Aniline & Chemical Co., Inc., 40 Rector St., New York, contains articles described by the following titles: The Processing of Dolls' Hair, Fugitive Tints, Continuous Dyeing, Scouring Fabrics Woven of Synthetic Fibers, Notes on the Tendering of Cotton Piece Goods in Bleaching, Dyeing and Printing, The Harris Tweed Industry, The Storing of Dyestuffs and Determining the Sensitivity of Dyestuffs to Copper. Copies of this publication are available upon request.

• du PONT RELEASES

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., announces release of the following new products:

"Celanthrene" Green BS—an acetate fiber dyestuff. It is a homogeneous color and, when used alone, yields bluish shades of green, the company says. The product may be used for the production of bright greens, niles and peacock shades in conjunction with "Acetamine" Yellow 5G and 3G. It exhibits satisfactory general fastness properties and is readily dispersible, it is claimed. The dyestuff is suitable for application to various types of acetate fibers such as combination crepes, taffetas, satins and knit goods, the company says.

Diazo Orange RFW, Diazo Red BFW, Diazo Scarlet GFW and *Diazo Scarlet FW*—four new "Pontamine" dyes. These developed colors represent an advance in this class of dyes because of their superior fastness to washing, it is claimed. Washing exerts a negligible effect upon the dyed shade and there is no danger of bleeding during laundering or wet processing. Even when subjected to a half-hour boiling soap solution, they show only a slight change in shade and a trace staining of adjacent white cotton, the company says. It is said that they level, penetrate and discharge well and range in shade from a bright reddish orange to blue red when developed with Beta Naphthol.

"Pontamine" Brilliant Violet BN—a direct color which produces brilliant bluish shades of violet. It may be dyed on cotton, rayon, pure silk, weighted silk and union materials, exhibiting satisfactory application and fastness properties, the company says. It is intended for the production of lilacs, heliotropes and similar pastel shades both as a straight dyed color and as a base for white discharge patterns, and it also works well in combination.

"Celanthrene," "Pontamine" and "Acetamine" are registered trade-marks of E. I. du Pont de Nemours & Company, Inc.

• PROMOTED BY HERCULES

The appointment of Lloyd Kitchel as general manager of the Virginia Cellulose Department of Hercules Powder Company was announced on May 7th by R. H. Dunham, president. Mr. Kitchel, who has served as sales manager in the department since 1926, takes the place vacated by P. B. Stull, now general manager of the company's Paper Makers Chemical Division.

The new head of Hercules' chemical cotton department was born in New York City, was graduated from Yale, and served in France during the war. Mr. Kitchel worked in the textile industry until 1926 when he joined Hercules as sales manager of the Virginia Cellulose Department. Since that time he has been active in extending the sale of bulk and sheeted chemical cotton into many industries throughout the world.

• JOINS CALCO

On May 1st, Mr. John F. Warner, for many years with Pacific Mills, joined The Calco Chemical Co., Inc., as Vice President.

The combination of his experience in textile printing and finishing work, with his early training at Standard Aniline Products and the Dye Division of Grasselli Chemical Company particularly fit him for coordinating manufacturing, research, technical and service divisions of Calco.

His many friends wish him great success in his new position.

• CEDARTOWN PLANT

Production in the new Cedartown, Georgia, plant of the National Oil Products Company of Harrison, N. J., will begin about May 15, according to an announcement made today by John H. Barton, vice-president in charge of production for the company, who returned recently from a visit to the 52-acre site.

The 10-building plant, which has been under an extensive construction and renovation program since January, will manufacture products used in textile processing, paper milling and other industries.

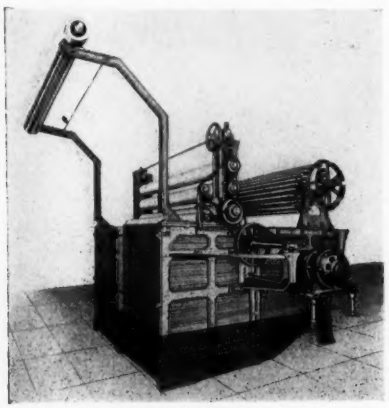
• JOINS MATHIESON

The Mathieson Alkali Works announces the appointment to its New York office sales force of James R. Harrington, for-

merly with the Titanium Division of National Lead Company. Mr. Harrington, who received his chemical engineering training at Washington University in St. Louis, will cover the Metropolitan Area for Mathieson.

• NEW ROPE SOAPER

The machine illustrated is for use in cotton and rayon printing and finishing plants for soaping after printing and for bleaching certain classes of fabrics. It has one or more compartments through which the goods travel spirally.



Innovations in design include among other features a triple nip stand which effects a double squeeze of the fabric. The rolls of this stand can be utilized to run in tandem or to give the fabric a double S turn (wrapping around the rolls 50 per cent in so doing).

A second new feature is a stainless steel trough under the squeeze rolls which collects dirty water from the goods and drains it off to one side into the sewer or back into an earlier compartment to use over again on dirtier cloth.

The tub is comparatively shallow with exceptional length from front to back, making for smooth handling of the fabric and minimum lifting strain. It can be furnished in heart stock cypress or in all stainless steel construction with any type of reel and any arrangement of rolls desired.

• DU PONT SAFETY RECORD

The du Pont Company announces that, based on reports from its various plants and office buildings, the safety record of the company in major injuries for the year 1936 is the lowest in its history. The number of employes in 1936 was 53,000, an increase of about fifteen per cent since the end of 1935. The total number of tabulatable major injuries, the company states, was 170. What is called the frequency rate was 1.9 major injuries per 1,000,000 hours of work. The fatality rate per 1,000,000 hours worked was 0.067. The severity rate was 0.83 days lost because of major injuries per 1,000 hours. These percentages establish all-time low records in the company's history. Some departments made especially impressive records. This was true in explosives manufacture where the frequency rate dropped approximately one-half. There were 92 plants, laboratories and construction operations of the company located in 27 states. Some of these have outstanding safety records. One, the Old Hickory Rayon plant of the du Pont Company, located near Nashville, Tenn., as of March 21, this year, established the best no-injury record in American industry, according to the records of the National Safety Council, and won for the second time the company's Board of Directors' Prize. It operated 525 days with a total of 11,361,846 man hours without experiencing a major injury.

The Belle plant of the Ammonia Department, at Belle, West Virginia, won the General Managers' prize on February 8, 1937, by operating 179 days with an exposure of approximately 1,677,000 hours.

As a result of du Pont safety work during recent years such hazardous industries as explosives manufacture have greatly reduced accidents.

The development of the diversified chemical manufacturing industry in the United States during recent years has brought about the discovery and manufacture of new products, hitherto not known to man. The problems involved in safely manufacturing these new products, as well as old established products, have made necessary a great deal of research work. In order to make certain that all products, new and old, will be carefully studied in regard both to their safe manufacture and safe application, the du Pont Company in 1935 established a laboratory, staffed with scientists and equipped on a scale not hitherto attempted anywhere, which minutely examines all new products, and also old products, in regard to their toxicity.

In discussing safety work recently, Lammont du Pont, president of the company, said: "The du Pont Company's activities toward preventing personal injuries to employes has produced outstanding results. Based upon the average annual frequency and severity rates over a six-year period, it is estimated the improvement in safety during the ten years following 1925, has prevented 197 fatalities, 387 permanent partial disabilities, and 4,654 temporary disability major injuries. This has been accomplished largely through increased recognition of the managements' responsibility for safety, improvement in employe supervision, arousing and sustaining employe interest in safety and their realization that they are required to work safely."

• BRITISH INDIAN DYE IMPORTS

British India's imports of dyes lagged somewhat in 1936 due to heavy dealer speculation in October, 1935, following the Italian-Abyssinian crisis in Europe, according to American Trade Commissioner George C. Howard, Calcutta, made public by the Commerce Department's Chemical Division.

This speculation, however, confined itself mainly to dyes available in India, and did not result in bringing in overstocks on speculative importing. The year 1936 opened with importers' warehouses practically bare, whereas dealers and retailers were in possession of fairly heavy inventories, the report states.

Importers felt their way carefully throughout the year, fearing that dealers were overstocked. While the value of imports declined slightly compared with 1935, the actual volume of sales into consumption improved and as the year closed, inventories of both importers and dealers were low, it was stated.

British India's imports of dyes during the first 11 months of 1936 were valued at 23,812,000 rupees ($8,900,000) compared with 24,400,000 rupees ($9,200,000) during the corresponding period of 1935. Despite the decline in total imports the United States improved its position in 1936—advancing to third place—supplying dyes during the first 11 months of the year valued at 1,146,300 rupees ($425,000) against 1,007,000 rupees ($373,000) during the 1935 period, official statistics show.

Consumption of dyes in British India in general is distributed 95 per cent to the cotton textile industry; 1 per cent for wool, silk, and leather; ¼ per cent for paper; ¼ per cent aniline pigments for paints, inks, etc.; ½ per cent for soap; and the remainder for a variety of purposes such as the coloring of foodstuffs, colorings for various religious and festival purposes and fireworks, the Trade Commissioner reported.

Of interest is the item of possibly 60,000 pounds of methylene yellow per month, included under cotton dyes in the above statements, which is used to color curry, sweets, and other foodstuffs.

Caravan drivers who transport indigo from India to Yarkand and Tibet mix the indigo with fodder to keep down mange among their camel charges.

Contrary to reports that appear from time to time in the Indian press, dye importers do not believe that the use of indigenous dyestuffs such as safflower, indigo, kamala powder, turmerie, babul bark and others is gaining, but feel that their

use is declining steadily owing to the ease of using, fastness, and brilliance of imported aniline dyes, it was stated.

Brilliance of color is a very important factor in the Indian dye market. During 1936 a new and very brilliant green was introduced by a German manufacturer and during the first week sales in Calcutta and Madras alone are said to have aggregated 1,300,000 rupees ($485,000), according to the report.

• DIASTAFOR MOVES

Mr. Sydney W. Fiske, Manager of the Diastafor Department of Standard Brands Incorporated, has announced that the department has moved from its former location at 595 Madison Avenue, New York City, to larger quarters at 691 Washington Street, New York. The new phone number is WAtkins 9-7300. The ground floor of the building has been taken over by his department.

HOWARD L. JENKINS

Mr. Howard L. Jenkins, who has called on the mills for the Diastafor Department for more than 15 years, is also making his headquarters at the new address. The trade is cordially invited to stop in and see the new offices at any time.

Fleischmann's Diastafor is nationally known as one of the leaders in its field. Warehouses are located at strategic points to make quick service possible at low cost. These points are New York; Philadelphia; Charlotte, N. C.; Boston; Cincinnati, and Pekin, Illinois.

The famous Fleischmann Laboratories in New York City, a million-dollar institution, are at the disposal of Mr. Fiske and his staff, to help solve the problems he meets.

The Diastafor Department was 29 years old on March 1. Mr. Fiske has been a member of it from the beginning.

• A. I. C. MEDAL

The medal of The American Institute of Chemists, presented annually for outstanding service to the science of chemistry or the profession of chemist in America, has been awarded this year to Dr. James F. Norris, professor of organic chemistry, in charge of graduate students in chemistry, and director of the research laboratory in organic chemistry, at Massachusetts Institute of Technology, according to an announcement made by President Maximilian Toch from the Institute's office at 233 Broadway, New York, N. Y. The award is made in recognition of Dr. Norris' outstanding service as a teacher and as an investigator in the field of organic chemistry.

The medal for the previous year went to Dr. Marston Taylor Bogert, professor of organic chemistry at Columbia University.

Dr. Norris' influence as a teacher on young men electing to enter the profession of the chemist has been outstanding. From 1895 until the present, he has taught chemistry, first in Massachusetts Institute of Technology, then at Simmons College, and at Vanderbilt University; lectured in chemistry at Harvard, and in 1916 returned to Massachusetts Institute of Technology, where in 1926, he became director of the research laboratory in organic chemistry.

He is the author of four text-books on organic and inorganic chemistry. He was chairman of the division of chemistry and chemical technology of the National Research Council, 1924-1925, and has been a member of the executive board since that time.

His chief activities in research recently have been in the study of the reactivity of atoms and groups in organic compounds and the effect of substituents in a molecule on the reactivity of the groups studied. He has investigated the problem from the standpoint of reaction velocities and temperatures at which certain bonds break under the influence of heat. For a number of years, he has been studying the extension of the Friedel and Crafts reaction, and is now investigating the causes which produce "steric hindrance."

In 1916, he was an associate of the Naval Consulting Board; in 1917 and 1918, he was in charge of war gas offense chemical research for the U. S. Bureau of Mines. He became Lieutenant Colonel in the Chemical Warfare Service in charge of the U. S. Chemical Warfare Service in England, in 1918, and was placed in charge of the investigation of the manufacture of war gases in German chemical plants, in 1919.

Past medalists of The American Institute of Chemists include Andrew W. Mellon and Richard B. Mellon, honored for establishing the Mellon Institute for Industrial Research; the late George Eastman, who made fine organic chemicals available to the chemists of the country; Mr. and Mrs. Francis P. Garvan, who established the Chemical Foundation; Dr. H. C. Sherman, for his food researches; Dr. Charles H. Herty, internationally known paper chemist, and Dr. James Bryant Conant, president of Harvard University.

The medal was presented to Dr. Norris at the annual dinner of The American Institute of Chemists, which was held in New York, N. Y., May 15, 1937.

• RESIGNS FROM HERCULES

William J. Lawrence, a director and a vice-president of Hercules Powder Company, and general manager of its Paper Makers Chemical Division, has resigned from the organization, effective May 5, to devote his entire time to the many businesses in which he is interested in the Middle West and the South. This action concludes a service of twenty-six years in the manufacture and sale of papermaking chemicals. During that period the use of PMC products became worldwide, not only in the paper business but in many of the other industries served by PMC.

Mr. Lawrence was born in Nova Scotia in 1891. Following his graduation from Shelburne Academy, he entered the textile and paper chemical business. In 1911 he became an executive of the Paper Makers Chemical Company, of Easton, Pennsylvania, and later, upon the organization of a number of companies into the Paper Makers Chemical Corporation, he was named president and general manager. When that company became affiliated with Hercules Powder Company in 1931, Mr. Lawrence continued as president and was elected a director of Hercules. Upon consolidation of Paper Makers Chemical Corporation with Hercules Powder Company in 1936, he became a vice-president and general manager of the new Paper Makers Chemical Division.

The management of the Paper Makers Chemical Division of Hercules Powder Company has been placed with P. B. Stull, a Hercules director, and formerly general manager of the company's Virginia Cellulose Department. The activities and organization of the Paper Makers Chemical Division will continue unchanged.

• 1937 FALL SILK CARD

Forty-eight new shades are portrayed in the regular edition of the 1937 Fall Silk Card, just issued to members of the Textile Color Card Association.

Reflecting the gay and colorful background of Latin American life is a special

group of radiant Pan-American hues. This collection includes vibrant renditions of red, rose, fuchsia, orange, gold, green, blue and purple. Our increasing interest in the Central and South American republics as a rich source of fashion inspiration renders these brilliant colors highly important from a style promotion angle.

Stressed among the basic shades are new developments in the brown family. These include a smart coffee tone, lively spicy browns and a high style reddish mahogany hue. The popular rust and copper families are newly interpreted in zinnia and reddish clay tones.

The wine range also occupies a strong position among Fall color preferences, in currant, grape and deep ruby types. Considered of most volume importance in the green gamme are the slightly yellowish casts, although bluish greens come in for high style recognition. Fall tones of blue, purple and grey also have a place in this silk collection.

Very new expressions of smart color harmonies and contrasts are suggested by the arrangement of the colors in the card. Among the more important combinations are Degas Rose and French Grape, Orchid Blue and Persian Ruby, Amber Rose and Zinnia Rust, Mayfair Grey and Titian Orange, Banana Pink and Tangera Brown and Desert Rose and Antique Mahogany.

● CHEMICAL MANUFACTURING INDUSTRY

Employment in the chemical manufacturing industry increased 1.2 per cent from February to March, 1937, total man-hours worked rose 1.0 per cent, and total payrolls advanced 2.8 per cent, according to the National Industrial Conference Board.

Average hourly earnings of wage earners in the chemical manufacturing industry in March were 68.6 cents, as compared with 67.5 cents in February and 60.9 cents in March, 1936. In the 25 manufacturing industries for which figures are compiled each month by the Conference Board, average hourly earnings were 65.9 cents in March, 64.2 cents in February, and 61.1 cents in March a year ago.

Average weekly earnings in the chemical manufacturing industry amounted to $27.94 in March, 1937, as compared with $27.52 in February, a gain of 1.5 per cent. These figures compare with average weekly earnings of $24.14 in March, 1936. In the 25 manufacturing industries reporting to the Conference Board, average weekly earnings were $27.49 in March, $26.68 in February, and $23.67 in March, 1936.

The average work week in the chemical manufacturing industry in March was 40.7 hours, which compared with an average of 40.8 in February, and 39.6 in March, 1936. In the 25 manufacturing industries as a whole the work week averaged 41.7 hours in March, 41.5 hours in February, and 38.7 hours in March, 1936.

● 1937 FALL WOOLEN CARD

The regular edition of the 1937 Fall Woolen Card, showing 38 colors, has just been released to members of the Textile Color Card Association.

An important feature of the card is the special collection of lively *Winter Sports Colors*, which include new versions of gold, rust, purple, rose, green and red. This animated group suggests a smart promotional theme for the merchandising of dresses, knitwear and sportswear in general.

Among the basic color highlights are new interpretations in the vintage range, including the purplish "pressed grape" and the browner "currant wine" types. Of interest in the brown gamme is a smart tobacco type, as well as tones of redder cast, such as the high-style mahogany rendition. The rust family reveals a new note in a brownish "cinnamon" shade, as well as a redder coppery tone.

Greens, regarded with increasing favor in the Fall color line-up, include slightly yellowish tonalities, which show promise of volume acceptance, and bluer types of novelty appeal. New interpretations of blue and grey are also represented.

OPEN FORUM

Rules under which this department of the REPORTER is conducted are as follows:

1. Anyone who has a technical problem on which he would like advice may submit it to the Reporter and it will be published in the first available issue.

2. Any reader who feels that he has a solution of the problem may forward his reply to us and if we feel that the reply is suitable it will be published in a succeeding issue.

3. For each such reply published the Reporter will pay a minimum of $2.

4. In case there is more than one answer to the same question, the one covering the subject in the most complete and authentic manner will be published, or if two answers are sufficiently different both will be published. If two answers are considered equally good, the one first received will be given priority.

5. The Reporter will assume no responsibility whatsoever for the accuracy of the answers submitted—it is simply offering a vehicle for the public expression of its readers' opinions.

6. Both the questioner and answerer must send in his complete name and address. When requested we will publish only the initials or other identifying insignia.

Unanswered Question

41—We would like to know the general principles of the process used in rendering silk transparent. Inasmuch as the process is to be used on rather heavy goods, we believe that one of the newer methods whereby thin layers of fiber have been rendered absolutely transparent is necessary. Information along this line which any of your readers are inclined to give will be highly appreciated.—**Library.**

CLASSIFIED

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED: Chemist capable to take charge or supervise the preparation, dyeing and finishing of rayon, acetates, cross-dyes,—Special experience in crepes—Cotton experience and original research work. Write Box No. 945, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

CHEMIST WANTED: Established manufacturer has opening for chemist possessing experience and knowledge of sulfonation and other textile specialties. State age, education, experience and salary expected. Replies strictly confidential. Reply Box No. 956, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.